The Fallen Tree

Understanding action-outcome linkages in the context of coal mining in Indian forests

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Understanding action-outcome linkages in the context of coal mining in Indian forests

MSc Environmental and Infrastructure Planning

Master Thesis

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ABSTRACT

"…If an organism or aggregate of organisms sets to work with a focus on its own survival and thinks that that is the way to select its adaptive moves, its "progress" ends up with a destroyed environment. If the organism ends up destroying its environment, it has in fact destroyed itself"

Gregory Bateson, Steps to an Ecology of Mind, 1972

India is the world's third largest producer of coal today (Rose, 2015) and is on its way to achieving an annual production capacity of 1 billion tonnes of coal. While elitist India marches on in its bold quest for development, vulnerable India is left to pay the price. Coal mines in India are, as in many other mineral rich countries, located in heavily forested areas. These forests have been home to tribal groups for generations, apart from a plethora of nonhuman life forms. While these social-ecological systems have withstood the test of time, their survival in the race for development is another matter altogether.

This thesis seeks to unravel the linkages between institutional actors and outcomes in coal mining in Indian forests. Understanding how nature and environmental risk are perceived provides a clearer picture of the motivations behind institutional actors' actions in the coal mining arena. A logical next step is then to understand the different ways in which the human-nature relationship is conceptualized. This forms a solid foundation on which to study coal mining in Indian forests and its impact on the social-ecological systems in them. Using the Institutional Analysis and Development Framework brings to light the different linkages in the coal mining action arena.

Using these tools to compare the cases of Jharia in Jharkhand and Singrauli, in Madhya Pradesh and Uttar Pradesh, both very important coal fields in India, patterns in the linkages between different factors and outcomes is analysed. In order to do so, three sub-questions are proposed, which combined, weave together the answer of the main thesis question. The thesis concludes with the observations and inferences that arise from the analysis. These include systemic issues such as fragmentation in policy-making, lack of implementation, the presence of a very top-down approach to governance. Safeguarding the social-ecological systems in the future will require these issues to be addressed.

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List of abbreviations

WB = World Bank

GP = Greenpeace International

GPI = Greenpeace India

FFF = Fact Finding Team

SLS = Srijan Lokhit Samiti

Reliance Group = Reliance Anil Dhirubhai Ambani Group

ABG = Aditya Birla Group

MCL = Mahan Coal Ltd.

CIL = Coal India Limited

NCL = Northern Coalfields Limited

MoC = Ministry of Coal

MPSMC Ltd. = Madhya Pradesh State Mining Corporation Ltd.

MoLE = Ministry of Labour and Employment

DGMS = Directorate General of Mining Safety

MoP = Ministry of Power

NTPC = National Thermal Power Corporation

CPCB = Central Pollution Control Board

MPCPCB = Madhya Pradesh Pollution Control Board

MoEFCC = Ministry of Environment, Forests and Climate Change

FAC = Forest Advisory Committee

INTUC = Indian National Trade Union Congress

GS = Gram Sabha

TSL = Tata Steel Limited

DVS = Dalit Vikas Sangatham

AMARM = Adivasi Moolvasi Astitva Raksha Manch

SJC = Save Jharia Committee

JMM = Jharkhand Mukti Morcha

KBSS = Karanpura Bachao Sangharsh Samiti

BCCL = Bharat Coking Coal Ltd.

NTFP = Non Timber Forest Produce

Figure 0 – Greenpeace India's campaign in Mahan, Singrauli, to raise awareness and stop coal mining from destroying the old sal forests of Mahan.
Source: Cropped from http://www.dw.de/greenpeace-india-the-government-is-trying-to-shut-us-down/a-18405634

1 INTRODUCTION

1.1 Motivation for research

Coal mining, the specific focus of this paper, has been conducted with zeal since India's days as a British colony due to its vast reserves of high quality coal (bp.com). Today, India is the world's 3rd largest producer of coal (Rose, 2015) Thus, the importance of coal in the Indian economy can hardly be overstated. In colonial India, timber was required for industrialization and railways, and thus coal mining was started in Jharia. Following Independence from British rule in 1947, the first Prime Minister of Independent India, Pandit Jawaharlal Nehru, set India on the path to catching up on development and rapidly industrializing and urbanizing. He was enthusiastic about big infrastructure projects, such as big dams and heavy industries, calling them the 'temples of modern India'. He vocalized the necessary sacrifice of communities affected by these projects in no uncertain terms when he put forth the ideal that sacrifice was unavoidable in the development of the nation (Kothari, 1996). Nehru believed that these 'modern temples' would affect a few initially but ultimately benefit everyone, even the displaced.

Was there any regard for forests in this period? The historical irony is that even though Indian tradition has always been closely connected to nature, the fathers of modern India appear to have viewed it primarily as a resource. Also noteworthy is that environmental awareness was probably non-existent in 1947 India. The Nehruvian era of modernizing, according to Sharma (2010), aimed at distributive justice, and propagated the thought that a few people may have to suffer for the general good. Perhaps encouraged by this, the government used the pretence of 'public interest' to exert its powers of eminent domain to forcibly acquire the assets of the people. It called upon the Land Acquisition Act of 1894 for this purpose (Sharma, 2010).

The situation today

As of 2014, India has been producing 620 million tonnes of coal and importing 400 million tonnes of coal annually. About 527 million tonnes (85 percent) of the coal produced comes from open-cast coal mines, which severely damage the ecosystem[1] (Rose, 2015). Anil Swarup, Permanent Secretary at the Ministry of Coal recently spoke of the Indian government's intention to double coal production by 2020 (Rose 2015) and produce an astounding 1 billion tonnes of coal per annum post 2020 (Das, 2015). This target may necessitate the opening of a new coal mine every month until 2020, with most of the coal produced feeding thermal power plants. The government hopes to revive the 8-10 percent GDP growth rate that India had in the decade 2001-2011, and to become entirely self-sufficient by minimizing or ending coal imports within a few years (Rose, 2015). The new Land Bill that is being tabled in the Indian Parliament this year, 2015 seeks to further dilute the requirements for social and environmental impact while acquiring land for industrial use (Press Trust of India, NDTV.com, 2015).

These ambitious goals naturally deepen the threat of forced displacement and ecological destruction that constantly looms over areas of potential coal mines. The resource curse is already too common an occurrence in India, with over 60 percent of mining districts being among the 150 most economically backward regions in the country (Chakravartty, 2011). India has a large indigenous population, which constitutes around 8 percent of the total population (SIEMENPUU, 2008). Many of these indigenous groups live in forests and have managed to live in relative harmony with it for generations (Norberg-Hodge, 1992). The destruction of forests for mining entails upsetting forest ecosystems along with the social systems that depend on them. Mining, especially open-cast mining, which is predominant in India, has disastrous long-term consequences on socio-ecological systems. Too often, these long-term consequences

[1] This will be elaborated in Chapter 4.

are ignored in favour of short-term economic gain, as people do not perceive it to be in their interest to care as much for ecological issues as for social and economic ones (Hayward, 1998).

1.2 Nature of research

1.2.1 Research Objective

The research was motivated by a desire to understand what makes socio-ecological systems in India so vulnerable to destruction, and how to protect them in the future and ensure their maintenance. The objective of this research is therefore to identify the major forces at play (interactions between actors and institutions) which lead to the outcomes seen. These outcomes include displacement of indigenous forest tribes, and deforestation by mining.

1.2.2 Research Questions

Broad question:

> How are socio-ecological systems in Indian forests affected by coal mining activities? What are the patterns in the way interactions between actors and institutions affect these social-ecological systems?

Specific questions:

1. Actors and positions:
   Who are the actors at play, and what are their positions? How do they interact in the coal mining action arena?
2. Institutional framework:
   How does the institutional framework influence the state of these socio-ecological systems and the actions of the actors?
3. Nature and risk perception:
   What can be inferred about the actors' perceptions of nature and environmental risk from their positions and actions?

1.3 Layout of the thesis

In this chapter, the motivation for research has been introduced, along with the questions this research seeks to answer. Chapter Two provides a literature review and elucidation of key concepts and frameworks that have been instrumental in providing a theoretical backbone for this thesis. The theory provided in this chapter relates to different components of the main research question and three sub-questions. Chapter Three contains a description of the methodology of this research, along with the methods used, and how data was collected and analyzed. In Chapter 4, the human-nature relationship aspect which is discussed in Chapter Two is brought out with a discussion on the impacts of coal mining on the social-ecological systems in forests in India. This chapter also introduces the two case studies in depth. Chapter Five contains three sections, each one corresponding to one sub-question presented in Chapter One. The inferences from the three sections are combined and discussed in Chapter Six against the backdrop of theory from Chapter Two. Chapter Six concludes this research by summing up the inferences of the three sub-questions, and using them to answer the main research question presented in Chapter One.

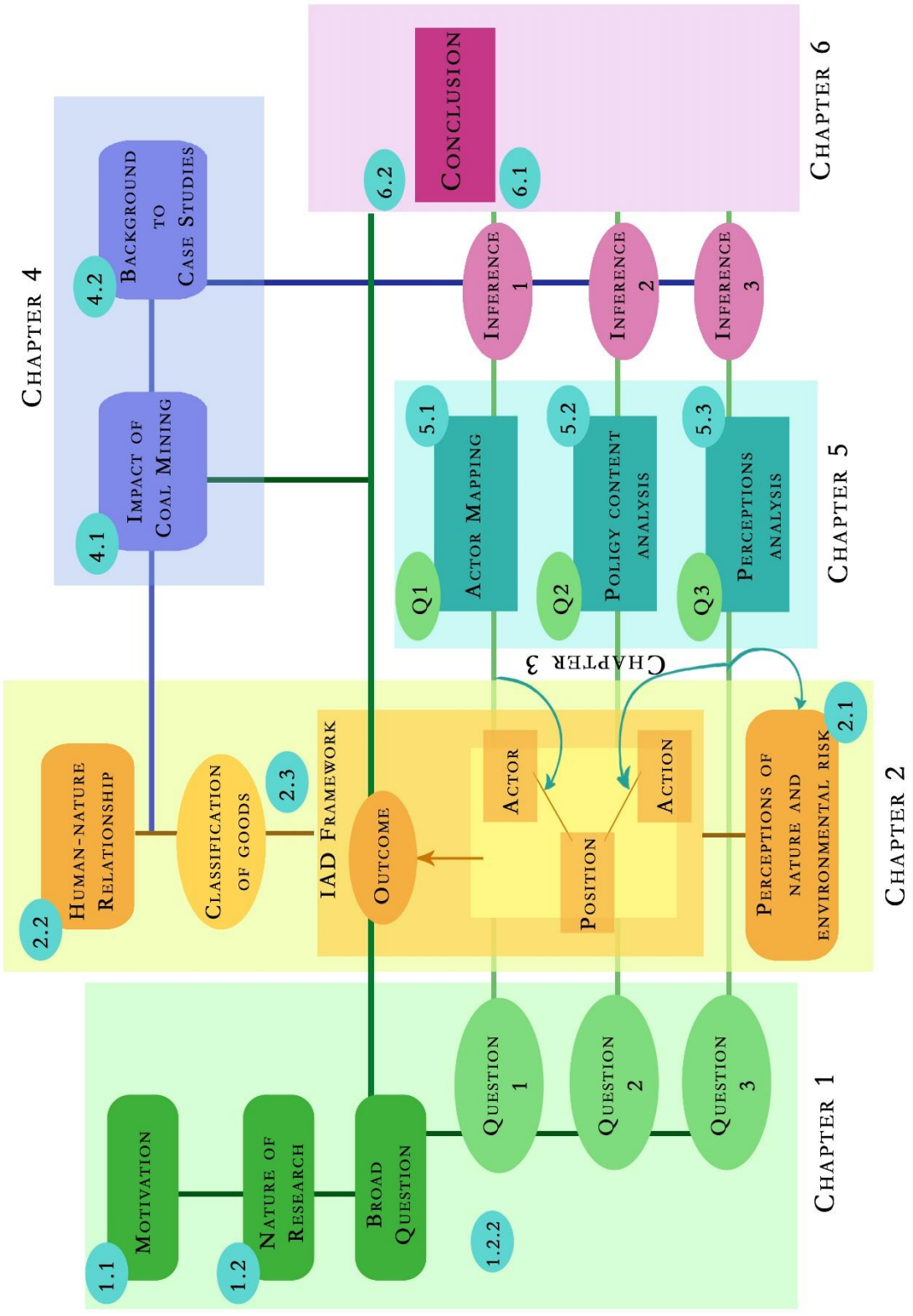


Figure 1.1 – Conceptual model of thesis structure

2 LITERATURE REVIEW

This section summarizes the literature that was studied to provide a foundation for this research. To better understand the interests and actions of different actors in coal-mining, it is important to first gain insight into the dominant worldviews which guide their actions. A useful way to begin is to try to understand the spectrum of perceptions of the rest of the natural world that exist. This section also describes how the perception of cultural landscapes is associated with the perception of nature, and explains the spectrum of nature perception. This is followed by a brief section elaborating the four perceptions of environmental risk as explained by the Cultural Theory of Risk Perception. The next section explains the concept of social-ecological systems and introduces two conceptualizations of the human-nature relationship – resilience of social ecological systems, and cultural landscapes. It then ties together these conceptualizations, explaining that using them in conjunction provides a more wholesome understanding of the human-nature relationship. The final section explains the Institutional Analysis and Development Framework and how it has been adapted to this research, and concludes with a description of the classification of goods.

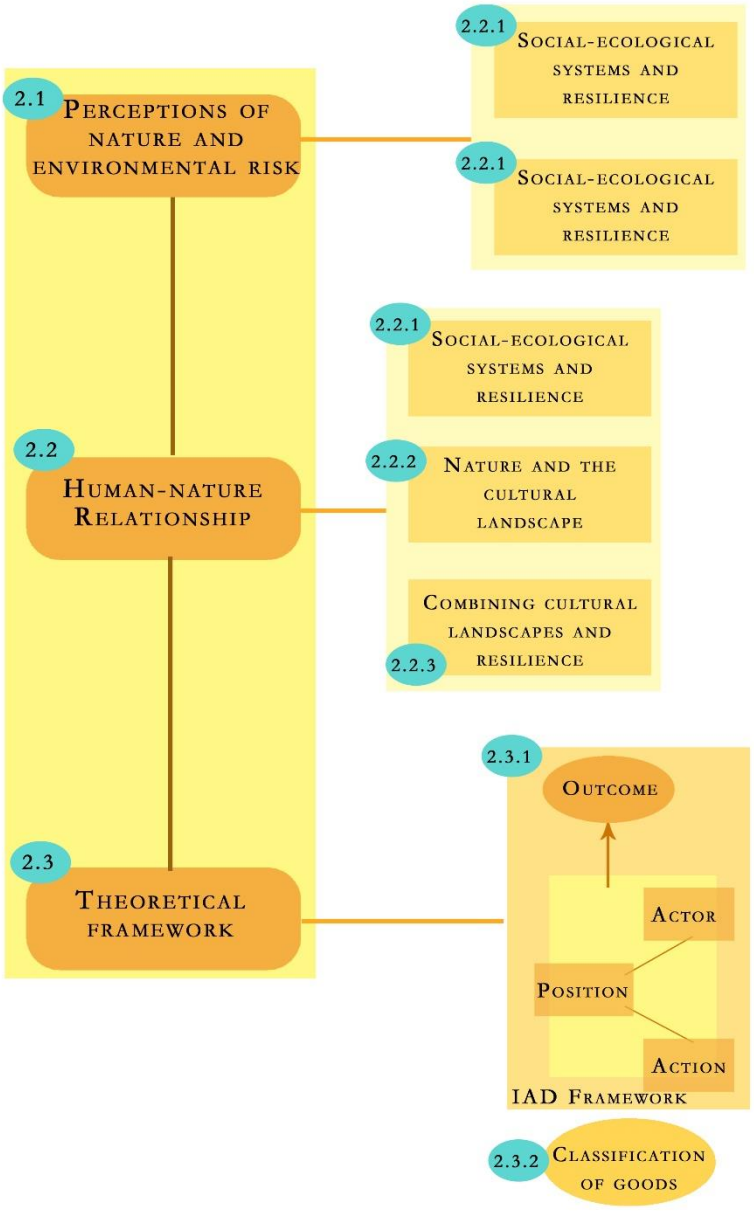


Figure 2.0 – Layout of Chapter 2

2.1 Perceptions of nature and environmental risk

2.1.1 Perceptions of nature

There have traditionally been two polar ends to viewing the relationship between humans and nature. One, based on the neoclassical paradigm, functions on the paradigm of examining how far reality is from the 'ideal' market. Since it uses cost benefit analysis to determine this disparity, all things are valued from a human-centric point of view. The objective is to maximize human well-being (O'Neill, 1993). It is from this standpoint that the rest of the natural world is also scrutinized – a thing or service is valuable only if it enhances the well-being of humans. Therefore, protecting ecosystems is only seen as being necessary if their existence adds to human well-being. This is similar to the shallow ecology or light green ecology that Benson (2000) describes. The other end of the spectrum is the 'deep ecology' approach, also called the 'deep green' approach (Benson, 2000). This approach stresses the 'intrinsic value' of non-human life and systems and rejects the anthropocentrism of the market-based approach discussed above. Figure 2.1 depicts the different approaches and values on the spectrum.

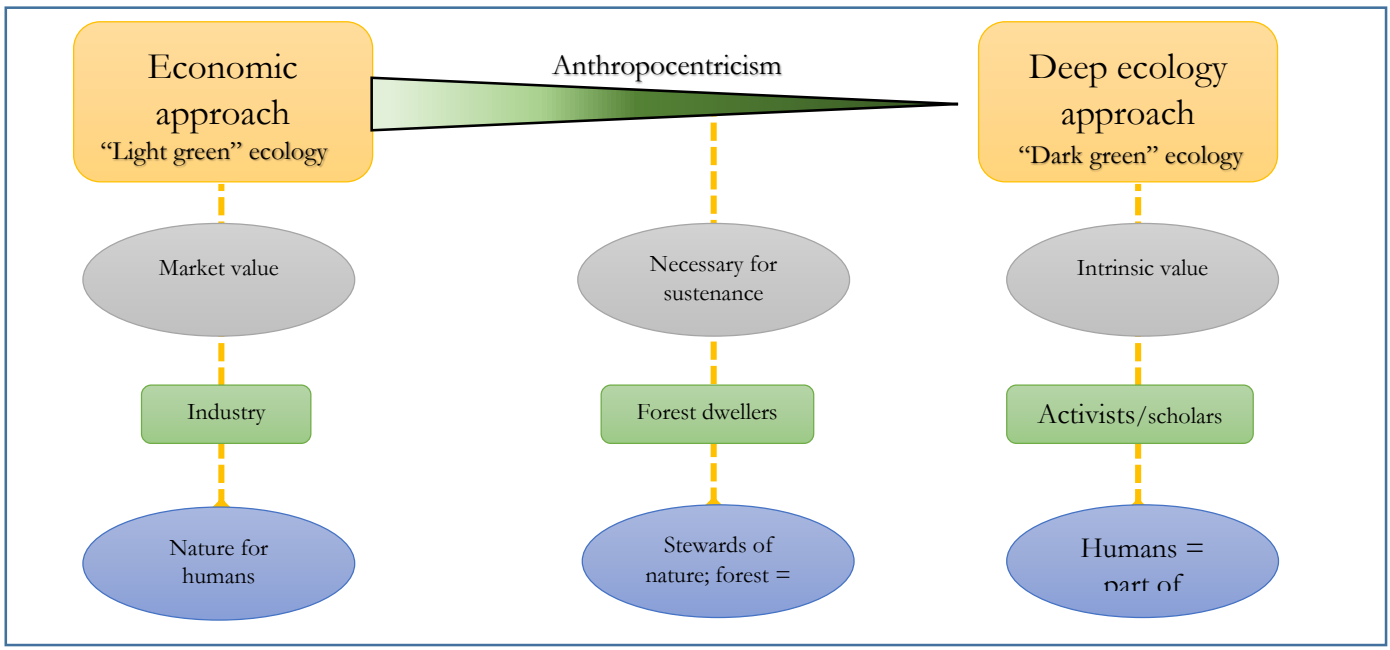


Figure 2.1 - Perceptions of nature

There are, furthermore, two types of deep green ecology distinguished by Benson – bio-centric and eco-centric. Those subscribing to the former attribute independent moral status only to non-human life forms. Those subscribing to the latter attribute independent moral status to everything, including non-living things and systems. Hayward (1998) points out that there are two common misconceptions about ecological values that require correction (particularly in reference to 'deep green' ecology. One is that the concept of 'intrinsic value' of nonhuman nature is difficult to define unambiguously. Adding to this, how does one regard this 'intrinsic value', and how does one deal with it? Another issue he points out is that deep green theory is often described as rejecting anthropocentrism, while this is in reality not the case. He argues that having regard for the welfare of non-humans does not imply a need for lack of concern for humans. He goes on to say that for certain reasons, anthropocentrism is often unavoidable and even necessary. This is because, firstly, humans are a part of nature and not unbounded. Secondly, the problem is misattributed to human empathy for other humans, whereas the problem is independent of this, and is purely the lack of concern for nonhuman nature.

Somewhere in between the two polar ends are different intermediate ways of valuing non-human nature. Benson (2000)'s idea of 'mid-green ecology' attributes intrinsic value to *some* nonhuman species, though not all. Hayward (1998) presents an interesting picture of how human interests may not indeed conflict with

ecological values, though some do. He uses the example of forest preservation to illustrate that different motivations may drive a policy framework or standpoint that achieve the same end result. For example, forests may be protected out of an interest in indigenous peoples and their homes. Alternatively, preserving biodiversity may leave many options open for future medical research. On the other hand, some may advocate forest protection on the grounds of inherent value, as discussed earlier. One has to consider at this point whether intention truly matters or not, in such situations. Perhaps it does, since protecting a forest, as the case in point, for its possible future value could also result in its destruction in the future once it ceases to be of value.

On the other hand, protection for the sake of intrinsic value, which is independent of human value attribution, ensures long-term protection. However, "often, perhaps even typically, those whose activities are the root cause of greatest ecological disruption and who reap its benefits are not the same people who bear the brunt of its environmental consequences" (Hayward, 1998). Governments and businesses, who are more often than not behind destructive activities, are reluctant to acknowledge the existence of problems, set unsatisfactory targets to mitigate them, and take very little effort to implement and enforce remedial measures (Hayward, 1998). This once again traces back to vested interests, and a conflict between short-term economic goals and long-term ecological imperatives. Despite the advocacy of the role of the market in addressing serious ecological issues, in reality market mechanisms appear to be continuing to promote destructive practices (Isomaki, 2006).

In reality, most people probably would not wish for ecological problems (Isomaki, 2006) and people "seldom if ever completely disregard the effects of their actions on nonhuman nature" (Hayward, 2000). That being said, it is unfortunately often the case that the economic and political powers and interests are complexly interlinked and leave people little choice but to stand by, support and condone environmentally destructive practices (Isomaki, 2006). Though the interest at large may be more for reasons more anthropocentric than not, as Hayward (2000) states, different motivations may still advocate the same outcome (protecting nonhuman nature).

Linked to this point is the perception of nonhuman nature of indigenous peoples in the forests where coal mining occurs. According to custom and tradition, many of them worship trees, land and believe that their deities, who reside in nature, will punish them if they unnecessarily meddle with it. They only take what they need, and that, in moderation. Thus, their religious beliefs promote a sort of mid- to deep-green ecology – the forest, and nonhuman nature (some or all of it) is recognized as having an independent moral status of sorts, and inherent value. What is more, they look at the forest as their mother. Tribes within a forest worship different animals and trees, and are allowed to eat animals and cut trees that are not symbolic to them. These informal rules allow a balance in exploitation to be maintained, which along with the dictum that one cannot take more than one needs, has perhaps been the reason many of these tribes have survived in the forests for so many generations. It is plausible that they consider them somewhere between being a part of nature and being stewards of nature – a worldview could be described as encompassing mid- to deep-green ecological values in accordance with Benson (2000).

2.1.2 Perceptions of environmental risk

Perceptions of resources, their value and abundance, in relation to the position of human beings in the ecosystem also shape the way in which different actors make decisions. This can be linked to environmental risk perception and accordingly, how an individual/group feels they must act. There are four categorizations of humans and their behavior with regard to risk perception and resources – fatalist, hierarchist, individualist and egalitarian, based on the Cultural Theory of risk perception (Douglas, 1992). Fatalists (nature capricious) perceive nature as unmanageable and uncertain. Thus, a key characteristic of fatalists is the perception of nature and resources as being unpredictable. They believe in coping with erratic events, and are of the view that it is pointless to bother with environmental risks (Steg and Sievers, 2000; Price, Walker and Boschetti, 2014). Hierarchists (nature tolerant) look upon nature as being a robust system within certain limits. Nature is seen as being in unstable equilibrium with scarce resources. They look to governmental regulations as the solution to controlling environmental problems. They believe that needs

cannot be controlled, and hence it is necessary to control resources (Steg and Sievers, 2000). Individualists (nature benign) consider nature to be a robust and resilient system which will always find its way back to stable equilibrium. They look to technological innovation as the key to solving environmental problems. Their risk management strategy, in contrast to hierarchists, is the market system; not governmental regulation. Egalitarians (nature ephemeral) see nature as possessing a 'precarious and delicate balance' (Price, Walker and Boschetti, 2014) and therefore believe that resources are not controllable, although needs are. They believe that consumption should be reduced in order to manage environmental problems. Therefore, their environmental risk management strategy is one that calls for behavioral and societal changes.

In conclusion to this section, this research takes the nature ephemeral standpoint that consumption of resources must be reduced and that fundamental behavioral and societal changes are necessary to do so. It follows the line of thought that at the very least, for human survival if not out of respect for nature's intrinsic value, it is imperative to be ecologically concerned and proactive. As Bateson (1972) wrote, "…if an organism or aggregate of organisms sets to work with a focus on its own survival and thinks that that is the way to select its adaptive moves, its "progress" ends up with a destroyed environment. If the organism ends up destroying its environment, it has in fact destroyed itself'. As will be elucidated in later sections, the behaviour of different stakeholders in the arena of coal mining (in Indian forests, in this research) may be connected with different categories of ecological values. Since worldview determines intention and motivation and ultimately actions, understanding worldviews (specifically with regard to nonhuman nature) is a very useful exercise. The discussions on perceptions of nature and environmental risk question necessitate a discussion about what 'nature' is. Is there even such a thing as a purely natural environment, and is it fruitful to study nature in isolation? The following section will seek to address these questions by discussing some important conceptualizations of the human-nature relationship.

2.2 Conceptualizations of the human-nature relationship

2.2.1 Social-ecological systems and resilience

One way of understanding the human-nature relationship has been through the study of the resilience of social-ecological systems. Traditionally, social systems and ecological systems have been studied in isolation and with different emphases. The social sciences have stressed on human interactions, usually minimizing or neglecting environmental influences. Ecology, on the other hand, has tended to focus on natural environments in which humans could be considered external elements (Liu et al., 2007). However, it is becoming increasingly clear that studying these systems in isolation is neither feasible nor useful. The reason for this is that there are effectively no ecological systems in the world that have not been affected in some way or other by human activity. Similarly, there are no social systems that live or can live in independence from ecological support, regardless of whether one adopts a 'light green' or 'dark green' ecological worldview. The key components of ecosystems are species and their environments, both physical and biological (Tansley 1935; O'Neill et al. 1986; Pickett and Cadenasso 2002, cited in Cumming, 2011). Structural and trophic relationships are predominant. Ecological resilience, from this perspective, is proportional to biodiversity. Social systems, on the other hand, are composed of people, their livelihoods, rules-in-use and worldviews. Social-ecological systems are not simply the sum of social and ecological systems – a complex system is not the sum of its parts (cite); they exhibit unique, complex behaviour (Westley et al. 2002). Social-ecological systems' primary components include people, organisms and ecosystem services (Cumming, 2011).

Carl Folke, director of science at the Stockholm Resilience Centre, describes some of the key attributes of social ecological systems as being resilience, persistence, adaptability and transformability (Stockholmresilience.org, 2015). Walker et al. explain the concept of resilience as "the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity and feedbacks". Adaptability, on the other hand, is the "capacity of actors in a system to influence resilience" (to manage the social-ecological system) (Walker et al., 2004). Folke describes

resilience as a lens with which to understand the interaction between people and their environments (Stockholmresilience.org, 2015). Moberg et al. (2014) suggest that "many of the serious, recurring problems in natural resource management stem from a lack of recognition that ecosystems and social systems are dynamically and inextricably linked".

In essence, the lens of social-ecological systems and resilience is quite relevant in the subject of this thesis – coal mining in Indian forests. As mentioned previously, indigenous communities have lived in these forests for generations, and have developed cultures tightly interwoven with the forest ecosystem. The ability of these social-ecological systems to sustain the feedback loops that maintain self-organization, both the essence of resilience, has sustained them for many years. However, they are now being subjected to external pressures in the form of mining which causes destruction and displacement. Though the focus of this research is not a qualitative assessment of the resilience of these systems, it is useful to bear in mind that resilience plays an important role in determining how the SES's are affected by mining activities.

2.2.2 Nature and the cultural landscape

Somewhat aligned to the concept of social-ecological systems is the concept of cultural landscapes, another conceptualization of the human-nature relationship. "Cultural landscapes are at the interface between nature and culture, tangible and intangible heritage, biological and cultural diversity – they represent a closely woven net of relationships, the essence of culture and people's identity. Cultural landscapes are a focus of protected areas in a larger ecosystem context, and they are a symbol of the growing recognition of the fundamental links between local communities and their heritage, humankind and its natural environment" (Rössler 2006:334, as cited in Plieninger et al., 2014). Within the study of cultural landscapes, there have traditionally been two manners of regarding them – one, in a material sense, and the other, in an abstract sense. Preservationists describe cultural landscapes as any land affected by human activity, and try to understand the impacts of these activities on (so-called) natural environments. They associate them with events and activities that are of cultural or aesthetic significance, and regard wildlife, and other natural and/or cultural life as being part of them. In this respect, cultural landscapes are treated as material objects.

The second perspective assigns cultural landscapes a more abstract status. In the 1980s, James Duncan began to question the prevalent notions of culture, which spilled over to notions of cultural landscapes. Denis Cosgrove, the historical geographer, posited that was "a historically specific way of experiencing the world develop by and meaningful to certain social groups" (Riesenweber, 2008). Kirchhoff, Brand and Hoheisel (2012) outline four possible ways to consider the term 'cultural landscape'. The first regards cultural landscapes as landscapes altered by human activity. The second definition defines them as "landscapes shaped by traditional forms of land use that are valued as putatively representing the result of a harmonious and unique human-nature relationship". This is the definition most closely aligned with the objectives of this research. The third looks at aesthetic aspects, and the fourth, at assigned meaning and value that does not necessarily arise from human modification of landscapes.

2.2.3 Combining cultural landscapes and resilience

Linking the concept of cultural landscapes and social-ecological system resilience has become increasingly necessary to gain a better understanding of the causes and consequences of change, as well as management strategies to deal with it. The resilience concept has been criticized for its failure to apprehend power dynamics in social-ecological systems change (Hornborg 2009, as cited in Pieninger and Bieling, 2012). On the other hand, the cultural landscape approach has been criticized for its inability to accept change, and its conservative outlook (Kirchhoff, Brand and Hoheisel, 2012). Linking the concepts provides a better understanding of the underlying processes that influence change in landscapes, and also acknowledges the fact that social values are contextual and place-dependent. This further leads to a better understanding of what manner of changes are acceptable while preserving the integrity of the system. Cumming (2011) uses the term 'spatial resilience' to indicate the interconnection between social-ecological systems and landscapes, suggesting that most processes in social-ecological systems have a spatial aspect involved. Kirchhoff, Brand and Hoheisel (2012) also suggest that despite surface-level differences in these approaches to understanding human-nature relationships, they are in fact, rather closely aligned. This is corroborated

by Selman (2012) who lists multiple similarities between the concepts, two of which are particularly of note. The first, is that both concepts are approached in terms of social and ecological subsystems, and the second is that both consist of continuous multi-level, multi-scalar intersections. The aspect of multi-level, multi-scalar interactions lends additional difficulty to addressing problems in these systems, termed as 'wicked problems' because of their unpredictability (Portugali, 2008 and Rittel and Webber, 1972 as cited in Gugerell and Roither-Voigt, 2014). The complexity of the problems that persist in such systems will become increasingly apparent in the course of this thesis.

2.3 Theoretical framework

2.3.1 The Institutional Analysis and Development Framework

The Institutional Analysis and Development Framework, or IAD Framework, was developed by Elinor Ostrom and colleagues at the Workshop in Political Theory and Policy Analysis to help in the study of institutions. They identified diversity as one of the main challenges in institutional analysis, suggesting that the range of situations confronted in the world made it challenging to find a common basis to study them. The IAD Framework was thus developed in an attempt to identify the basic building blocks of a situation, components that could be identified in the study of any situation (Ostrom, 2005). A key characteristic of the Framework is its versatility in being adaptable to nearly every situation. It is also very flexible in its usage, as Ostrom points out, it has been adapted and modified in many ways over the years (Crawford and Ostrom, 1995). In a nutshell, the Framework describes interactions within a unit called the *action situation*, and the factors that externally influence these interactions. The action situation is influenced by three main '*exogenous variables*' – biophysical conditions (nature of resource), attributes of community (worldview or culture), and rules-in-use (institutional arrangements). Figure 2.2 shows the broad IAD framework, with exogenous variables, interactions, outcomes and the action situation.

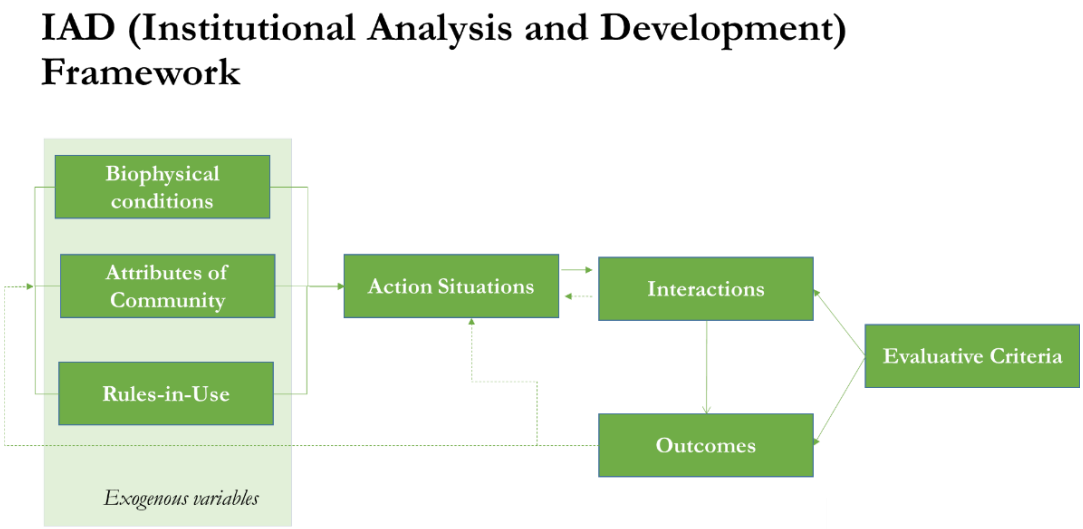


Figure 2.2 – The Institutional Analysis and Development Framework
Source: Adapted from (Ostrom, 2005)

Action situation

The action situation itself is a conceptual unit that is used to understand behavior and interactions within institutional arrangements. Individuals in an action situation 'interact, exchange goods and services, solve problems, dominate one another, or fight' (Ostrom, 2011). Within the action situation, seven types of variables are described, which essentially serve as the building blocks or basic components of the situation.

These are – participants (actors), positions, actions, information, control, payoffs and outcomes. The first variable, **participants**, is understood by determining which actors are stakeholders are directly involved in the action situation. Four types of information are important when describing and analyzing actors in a

situation. These are the resources the actor provides, the value the actor assigns to different actions and states of the world (priorities, personal values, etc.), the way the actor analyses and understands information, and the manner in which the actor selects courses of action. The next variable, **position**, pertains to the roles that the actors have, as well as what the different possible positions are. **Actions** are understood as the different actions possible, as well as the different choices that exist. The **information** available to different actors regarding the condition of the resource and the costs and benefits of their potential actions is the fourth variable. The fifth is the **control** variable, dealing with how much control actors have over choice, and whether they can act of their own accord or must consult with others. **Payoffs**, the sixth variable, pertain to the costs and benefits for each actor to perform a particular action out of the set of actions available to them. The final variable, **outcome**, relates to the linkages between actions and outcomes. It also examines which outcomes are possible and which are favorable or detrimental to the different actors (Crawford and Ostrom, 1995, 2005). In this research, focus has been given to the first three variables mentioned – actors, positions and actions – and their linkage to outcomes. To understand this, the exogenous variable of rules-in-use (in this instance, formal rules), which will be discussed in the next paragraph, has also been factored in.

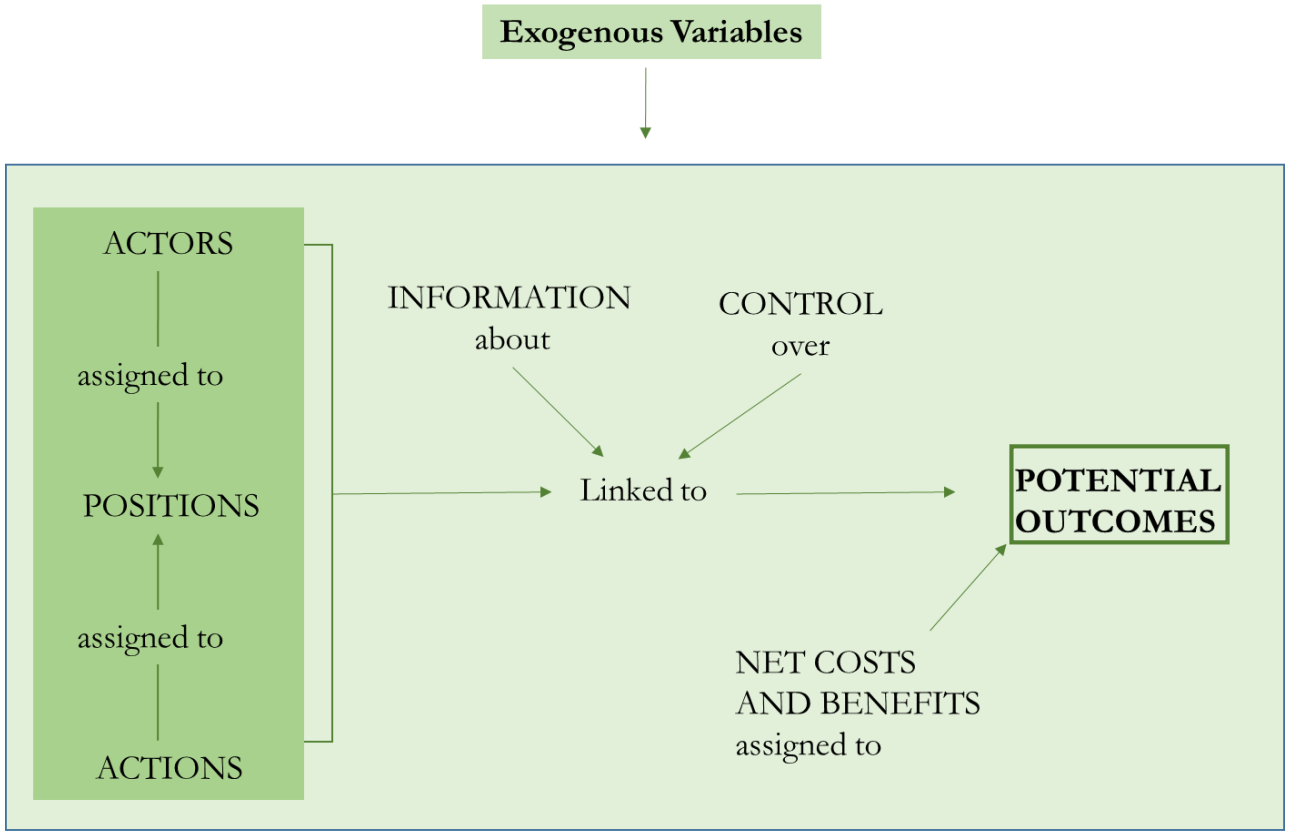


Figure 2.3 – The internal structure of an action situation, highlighting the focus of this research
Source: Adapted from (Ostrom, 2005)

Exogenous variables

The three exogenous variables considered in the IAD Framework, as mentioned, are attributes of community, rules-in-use and biophysical conditions or nature of resource, which is described in depth in the next section. Community attributes pertain to the norms of acceptable behavior within the community, the level of common understanding that exists among community members about the particular action arena, and worldview or culture (Crawford and Ostrom, 1995). When all the participants share similar values and interact with each other in multiple ways, the informal rules they develop to maintain relationships are generally strong. Trust is a very important community attribute (Ostrom, 2005) that determines how the community responds to the issues it faces. Rules, on the other hand, or institutional arrangements, describe

which actions are required, prohibited and permitted. They create positions, describe how participants enter and leave these positions, about the permissibility of actions, and about the outcomes of these actions. Rules have prescriptive force; in situations structured by rules individuals often determine their actions based on their evaluations of the incentives they might face for different actions. These actions are determined from the set of possible actions that are deemed allowable. Therefore, rules shape the structure of the situation where actions are selected (Ostrom, 1986), and they do so in three ways. Rules may indicate what is *not* allowed, implying that the remainder of actions are allowed; they may suggest what *is* allowed, implying that anything beyond the bounds of what is allowed is not allowed; and finally, they may indicate which outcome is *required.*

2.3.2 Classification of goods

In the characterization of the nature of resource, in the IAD Framework, two key concepts are used to classify goods. These are excludability, discussed in conjunction with the free-rider problem, and subtractability. Excludability relates to the difficulty of restricting beneficiaries from the provision of a good or service. A good has low excludability when, regardless of the contribution of members of the group, the benefits of that good are available to them. Free-riding, a related concept, occurs when the members of a group take advantage of the good's low excludability, and do not contribute to the provision of the good or service. When excluding free-riders is costly, the incentive to provide services at one's own initiative reduces, which in turn may lead to underinvestment in and poor maintenance of the service. The size of the group also influences the ease of free-riding. In smaller groups, it is easier to interact and reach consensus whereas in larger groups, there is less opportunity to interact directly. For instance, within a tribal group or village, interaction between members is fairly easy when compared to interaction between members of the group and a national ministry. Furthermore, there are instances where consumers do not have the option to decide whether or not to consume, particularly with goods with excludability problems. For instance, the majority of citizens of a country may not wish to consume coal-based energy, but may not be presented with easy alternatives to avoid consumption altogether, because of the infrastructure in place. The second concept, as mentioned, is subtractability, which determines how the consumption of a good by an individual affects the availability of that good for another individual. In order to allocate scarce, fully subtractable services productively, it is necessary to have an effective system of rules in place (Crawford and Ostrom, 1995, 2005).

Based on these two key attributes, goods are classified into four types, as shown in Table 2.1. The four types of goods as per this classification are toll goods, private goods, public goods and common pool resources. Toll goods are characterized by low subtractability and high excludability, indicating that while their consumption by an individual or group does not limit their availability for other members, their consumption is easy to control and restrict for certain members. Private goods are characterized by high excludability and subtractability: their consumption limits their availability to others, and their accessibility is easy to control and restrict. On the other hand, public goods are characterized by low excludability and low subtractability, meaning that they are both difficult to restrict and control, and their use by some group members does not limit their availability to the others. Finally, common-pool resources are characterize by low excludability and high subtractability – they are difficult to restrict and control, but easy to deplete (Crawford and Ostrom, 1995, 2005).

	Subtractability		
		Low	*High*
Excludability	*Difficult*	Public goods	Common-pool resources
	Easy	Toll goods	Private goods

Table 2.1 – Classification of goods
Source (Ostrom et al., 1994)

Impure public goods

In addition to the four conventional types of goods, a fifth type may be classified. Gugerell and Roither-Voigt (2014) describe impure public goods as being hybrids between private and public goods, at the interstice of individual property rights and public interests. In the case of impure public goods, such as landscapes, individual property rights may be curtailed to cater to public interest (Gugerell and Roither-Voigt, 2014). This is reminiscent of the Nehruvian model of development which is described in Chapter 1.

Why does it make sense to describe landscapes or environments as impure public goods? From a property rights perspective, landscapes can be considered private goods; yet, this is a rather restrictive definition. Additionally, Gugerell and Roither-Voigt (2014) explain that the public also has rights on the landscape – to a safeguarded quality of air and water, or to a functioning ecosystem. However, one can also consider landscapes as club goods or common pool resources, like the grazing grounds described by Ostrom (1995). Thus, it is seen that in landscapes, though there exist private rights, which curtail and restrict the use of the landscape by third parties, these do not in themselves prevent or exclude third parties taking certain value out of the landscape, e.g. aesthetic value. This setup is called 'divided ownership'. (Gugerell and Roither-Voigt, 2014). Further, Gugerell and Roither-Voigt (2014) link landscapes as impure public goods to governance in that all landscapes – elite masterpieces as well as vernacular landscapes – are of public interest. Consequently, it becomes relevant to include the goals of inclusivity in landscape development and heritage issues.

Forests in India, pertinent to the thesis, by extension, can also be considered to be impure public goods, though with a little deviation from the explanation above. From a property rights perspective, tribal groups have customary rights over it, but although forests come under State jurisdiction, they are not owned by them per se. 'Forests' is an item under the Concurrent List in the Constitution of India. Considering that the Indian government is envisioned as a democratic system, the state is a representative of the people of India, and therefore represents, in effect, public interest.

3 METHODS

3.1 Case study methodology

The question that motivated this research, proposed in Chapter 1, required an understanding of actions, positions, actors and their motivations. Therefore, a qualitative analysis of the factors leading to specific outcomes was necessary. For this, the case study methodology (Maruster and Gijsenberg, 2013) has been used.

The study of specific cases has its merits in that it is possible to gain a nuanced understanding of the factors which contribute to an issue (Kumar, 1999). The issues being studied are inherently highly complex, thus rendering generic study both pointless and difficult to manage, and keep track of. Honing in on a particular place's issue allows for greater depth in understanding. A deep understanding and micro-level examination was particularly necessary in this research, as the research essentially centres on understanding patterns in linkages and outcomes.

Comparative analysis

At the same time, studying just one case may lead to misinformed conclusions, or difficulty in grasping linkages to the larger context of the issue, which are equally important. For this reason, two cases were selected for study. They were compared at every stage, to give better context to the findings and to generate a bounded spectrum within which to understand the results and observations. Comparing two cases thus provided a way to mutually reinforce the understanding of one with the other (Yin, 1994).

The two cases selected for study were Jharia in the state of Jharkhand, and Singrauli district in Madhya Pradesh, both in India. Though they are fleshed out in Chapter 4, the criteria for selecting them were as follows:

1) They are both important as coal reserves and are relevance to the current Indian scenario.
2) Both cases have or have had tribal (*adivasi*) populations for generations, closely associated with the forests.
3) There is or has been a significant forest cover in both cases. Although Jharia is no longer covered in forest, the state of Jharkhand still contains many old and highly bio-diverse forests. Singrauli still contains forest lands, though these are under threat from coal mining companies. Like Jharia, Singrauli is present in a state (Madhya Pradesh) which still contains old (sal) forests with high biodiversity.
4) They were initiated at different points in Indian history. Jharia is much older than Singrauli having been started when India was still was British colony. It is interesting to note that international pressure to conserve forests did not play a part in Jharia's initial phases of development as a coal mine. On the other hand, mining in Singrauli was started soon after Indian independence, and due to the fact that there are yet coal blocks in Singrauli that have not been mined, international and national pressure to protect these forest lands has influenced the story of Singrauli.

3.2 Institutional analysis

In order to understand patterns and linkages under the themes in the research questions – actors and positions (Question 1), the role of the institutional framework (Question 2) and positions, actions and perceptions (Question 3), an institutional analysis was considered appropriate. This made sense particularly as it was in line with the path of enquiry of the main questions and sub-questions proposed at the outset.

The Institutional Analysis and Development (IAD) framework was a very useful tool to gain insight into the factors in an action situation, such as coal mining. Its flexibility to adaptation made it further useful to zoom in on certain linkages influencing outcomes, while understanding roles of others. It additionally

allowed for an unbiased analysis, as it is fundamentally unbiased to any type of institutional setup (Ostrom, 2005). This also meant that any type of governance could be understood through this versatile framework. Thus, the IAD framework, with its flexibility, versatility, its ability to be used for multiple levels of institution as well as its insightful representation of linkages between different components influencing an outcome, made it a very powerful tool to adopt to this research.

3.2.1 Data Collection and Analysis

In order to obtain data for this research, certain pertinent policies, documents and journalistic reports were studied. From these, information regarding key actors, their roles, and their stakes could be gathered. This data later fed into different analyses, which together shed light on the linkages and patterns the research questions sought to determine.

Policy and document study:

The policies and documents used below were determined to be most closely relevant to mining, forests and tribal communities. This list was adapted from a report by Greenpeace India (2011) in which a compiled list of policies and documents was presented in relation to coal mining in Singrauli. This list has further been added to by the author of this thesis through independent research.

- Mines and Minerals (Development and Regulation) Amendment Act 2015 - As an amendment to the Mines and Minerals (Development and Regulation Act) 1957
- National Mineral Policy, 2008
- Mineral Conservation and Development Rules, 1998
- Coal Mines (Special Provisions) Act, 2015 - As an amendment to the Coal Bearing Areas (Acquisition and Development) Act, 1957 and the Coal Mines (Nationalization) Act, 1973
- Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (Amendment) Act, 2015 – As an amendment to the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013. The 2013 Act originally replaced the Land Acquisition Act, 1894.
- Coal Bearing Areas (Acquisition and Development) Act, 1957
- Panchayats (Extension to the Scheduled Areas) Act, 1996
- National Environment Policy, 2006
- The National Forest Policy, 1988
- Forest (Conservation) Act, 1980
- Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006
- Wildlife Protection (Amendment) Act, 2006
- Environment Protection Act, 1986
- Environment Impact Assessment (EIA) Notification, 2006
- Air (Prevention and Control of Pollution) Act 1981
- Water (Prevention and Control of Pollution) Act, 1974
- The National Green Tribunal Act, 2010

The study of policies and documents further shed light on the role of governmental ministries and their stakes in the coal mining arena, at least on paper. This then brought out discrepancies and contradictions between the institutional framework on paper, and its practical implementation.

The IAD Framework

As mentioned previously, the IAD framework was a useful organizational tool to understand different factors and linkages, leading to outcomes. The main research question pertains to outcomes, while the three sub=questions pertain to different linkages represented in the framework. For Question 1, the linkages between actors and positions were important. The tool used to study this linkage, *actor mapping*, is explained in a subsequent section. For Question 2, the link between actors and positions was once again important, though implicitly, in addition to different themes under policies, alike to the rules-in-use of the institutional framework. A *policy content analysis* was a useful tool to examine these linkages. Finally, for Question 3, the

linkage between position and action was important, for it was from this that the perception of nature and risk perception of different actors could be understood.

Actor mapping

To answer Question 1, it was necessary to understand the linkages between actors against the backdrop of their positions. Actor mapping was therefore seen as a useful tool to bring out these linkages. Through the actor maps, it was possible to display the field of actors that are prominent in each case study. Naturally, there are many actors in each case, but actor mapping served as an automatic filter, backed by research, to display the most active and important actos. By placing them on four levels – local, regional, national and international, it was also possible to perceive concentrations of actors with an added dimension.

As mentioned earlier in this Chapter, the issues in these cases are complex, with multiple levels and actors. Actor mapping, with its ability to capture multiple levels and actors, was therefore a convenient tool. Additionally, it was possible to depict different types of interactions and directions of dependency. Apart from adding further depth to the analysis, this was also rather telling about the situation in each case, when they were compared. A final remark on actor mapping as a tool for this research is that it made it possible to compare complex linkages and interactions in the two cases. This comparison yielded insights which were fundamental to answering Research Question 1.

Policy content analysis

Once the list of pertinent policies was made, they had to analysed, in order to answer Question 2. A thematic content analysis was therefore done, to tabulate different aspects addressed in the policies. Through this, it was also possible to see which topics were most were most frequently discussed in policies – for example, 'affected people' and 'environmental protection'. As an added dimension, whenever apparent, themes were marked by colour to show favour for or against socio-ecological system protection under different policies. Finally, clusters were made, grouping both policies and frequently occurring themes. This added the dimension of similarly themed policies to the analysis.

4 COAL MINING IN INDIA

4.1 Impact of coal mining

Tribal groups have been living and depending on forests all over India for generations. The relationship between tribal communities and the forest are shown in Figure 4.1. Considering that Madhya Pradesh and Jharkhand, are or were both covered with dense forests, tribal groups are very much present in these regions. Their having lived relatively harmoniously with non-human nature for so long means that the forest might be considered as a sort of cultural landscape (Norberg-Hodge). Tribal cultures, furthermore, are highly dependent on the context in which they arise, and are often closely associated with their immediate surroundings.

Their cultures also invariably reflect an intrinsic reverence of non-human nature, often associated with worshipping non-human nature and the forest. This would have been necessary to ensure survival in a sustained manner. To overexploit the forest upon which they are so dependent for their basic needs – food, water and shelter – would have been inimical to their survival. Thus, their worldview has traditionally been one of regarding the forest as their "mother" (SIEMENPUU, 2008), taking only as necessary and understanding seasons and cycles, so as to allow for replenishing and regeneration. Their social networks, which are central to their lives, also revolve around their activities in the forest. Women, especially, depend on these for support – activities such as gathering fuel, cooking and so forth are often social activities that build networks and relationships with others (Vanclay and Esteves, 2011; (Lahiri-Dutt and Macintyre, 2006). Furthermore, many resources are common community resources (SIEMENPUU, 2008; Vanclay and Esteves, 2011). Curtailing of access to these makes families and the community as a whole vulnerable.

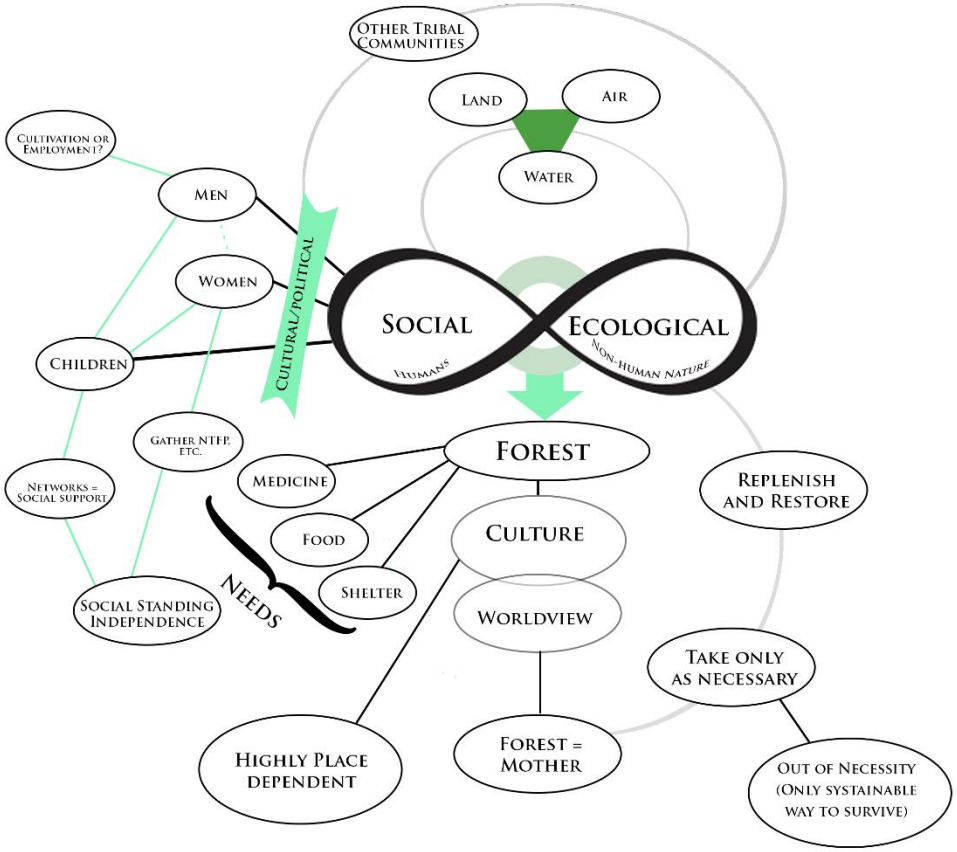


Figure 4.1 - Dependency on forest

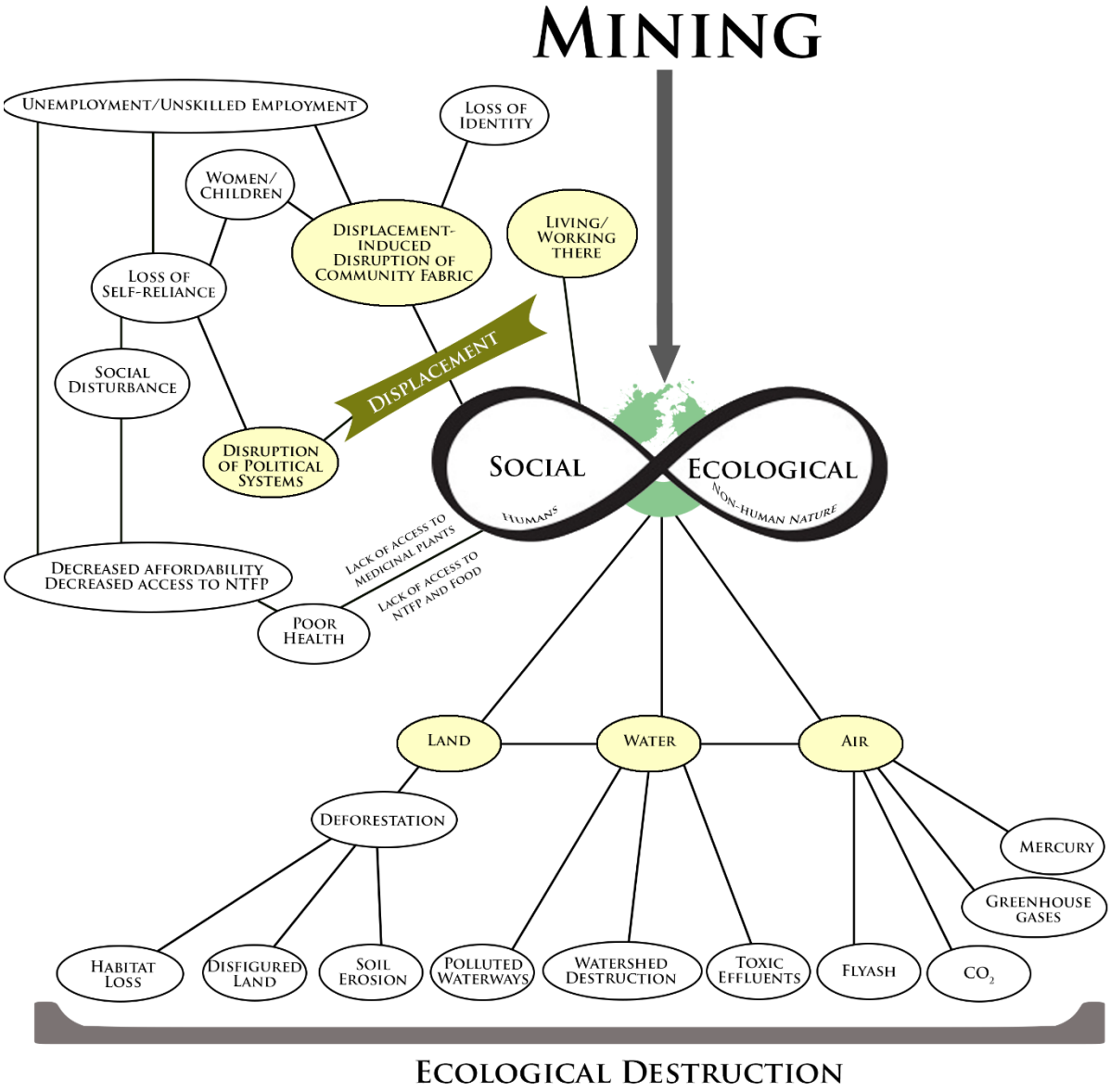


Figure 4.2 – Impact of mining on social-ecological systems in forests

Mining activities in forests cause major social-ecological disturbances, as shown in Figure 4.2. It fundamentally disrupts the ecosystem by destroying the land and polluting water bodies and the air. As a prerequisite, of course, the forests on which these mines are located are stripped bare of their vegetation. These forests are invariably home to a multitude of species existing in a complex web of dependencies, which are irreversibly broken when the forest is cleared, and mining begins. Furthermore, mining displaces tribal communities from their ancestral lands and disturbs the intricate social fabric of these communities that sustain them.

As mentioned, these communities are usually very dependent on social networks for support and self-reliance, when these are affected, they become debilitated. This loss of self-sufficiency is particularly harsh on women, who tend to be less mobile than men. They lose their independence and their means of livelihood (Ahmad and Lahiri-Dutt, 2006). Losing the land upon which they have existed for generations affects their sense of identity as individuals and communities, especially since, as mentioned, local cultures are usually place dependent. This is akin to the concept of the memory associations of cultural landscapes

(Gugerell and Roither-Voigt, 2014). With regard to promises of employment, as there is usually a requirement for skilled labour, employment opportunities (which are often part of the deal made by the corporations) are few, and unemployment increases. Poverty due to unemployment is made worse by unmet promises of support and compensation by the corporations/governmental bodies. In many instances, governmental bodies are ineffective and not very invested in protecting the interests of these communities. Women, once again, are more vulnerable to unemployment due to prevailing gender biases (Thukral, 1996). Unemployment and lack of financial security make the communities more vulnerable to disease, disaster and disturbance of any kind. The destruction of the support systems which conventionally sustained them further weakens their resilience. Increased exposure to dangerous substances for those living in and around the mining sites, including the displaced, makes the communities more vulnerable to adverse health effects, which is exacerbated by their lack of medical security.

Another problem is land alienation, since ancestral lands are not usually accompanied by official land deeds. This makes these communities more susceptible to eviction and forced displacement. With the loss of property rights and land alienation (Vanclay and Esteves, 2011; Vanclay et al., 2015) communities that are already vulnerable to begin with are given an unfair disadvantage in the game of development. The disruption of community fabric also disrupts their political systems and by extension, their ability to participate in crucial decision making processes (Vanclay and Esteves, 2011; Vanclay et al., 2015).

Ahmad and Lahiri-Dutt (2006) write that "the effects of displacement are not gender-neutral, given that women and men have well-demarcated gender roles in indigenous communities, and that the impacts of mining on women and men are not the same". Extant intra-household inequalities are generally made severe by economic stress, which affects literacy, health and nutrition levels. Further, poor sanitation facilities, which invariably arise, make women more vulnerable to physical and sexual harassment. Sanitation problems also make it difficult for women to work as daily-wage labour (Thukral, 1996). Displacement-induced morbidity is another problem faced by women of these communities. Poor nutritional and health levels worsened by economic stress, along with the already high mortality rate, make women especially vulnerable to displacement-induced morbidity (Thukral, 1996). Cernea's model of 'impoverishment risks through displacement' further elaborates on these (Cerena, 1997). In the face of a never-ending spiral of insecurity, unemployment and poverty, other issues such as alcoholism, prostitution, gambling and crime are seen to increase (Thukral, 1996).

Open-cast mining or strip mining as it is aptly called, destroys landscapes and forests. Species' habitats are destroyed, as mentioned (Web.mit.edu, n.d.). Mining clears out top soil, which is a very nutrient-rich layer of soil that takes a very long time to generate naturally (Web.mit.edu, n.d.; Goswami, 2013). It is on this layer of soil that vegetation grows, and it is due to vegetation that soil remains compact. When top soil is removed, the land is prone to soil erosion and degradation. Rain further degrades the land by washing away the loosened soil, which sediments in waterways and pollutes them (Web.mit.edu, n.d.). This affects fish and plant life and disfigures river channels, which in turn increases the risk of flooding. The soil that washes into waterways usually carries chemicals from the mining processes, which in turn pollute the waterways and seep into the groundwater table. Consumption of this polluted water affects the health of the entire ecosystem, including its human inhabitants. Additionally, the land which has been mined loses its water table, which affects the watershed (Greenpeace International, 2010).

Another problem caused by mining is mercury contamination. Mercury, an amalgamating agent, enters water sources and the air in the form of mercury tailings (Web.mit.edu, n.d.). Mercury contamination is a major issue in Singrauli. Additionally, mining, being an energy intensive process, requires a large input of fossil fuel, which causes a large carbon output, which in turn exacerbates global warming. The output of carbon is further contributed to by coal fires, which frequently occur in coal mines, when coal comes into contact with oxygen. Coal fires, as seen in Jharia, can burn for centuries, releasing carbon monoxide, carbon dioxide, methane, sulphur dioxide and other toxic gases, along with flyash. Flyash settles on the land and enters water bodies, rendering them both unusable and highly toxic (Greenpeace International, 2010; Web.mit.edu, n.d.).

Thus, it is evident that coal mining causes a plethora of social and ecological problems. The next section will introduce the two case studies used in this research, and narrate the story of coal mining in each.

4.2 Introduction to the case studies

The map in Figure 4.2.1 shows the positions of Jharia and Singrauli, the two coalfields used in this study, on a map of India's coal fields.

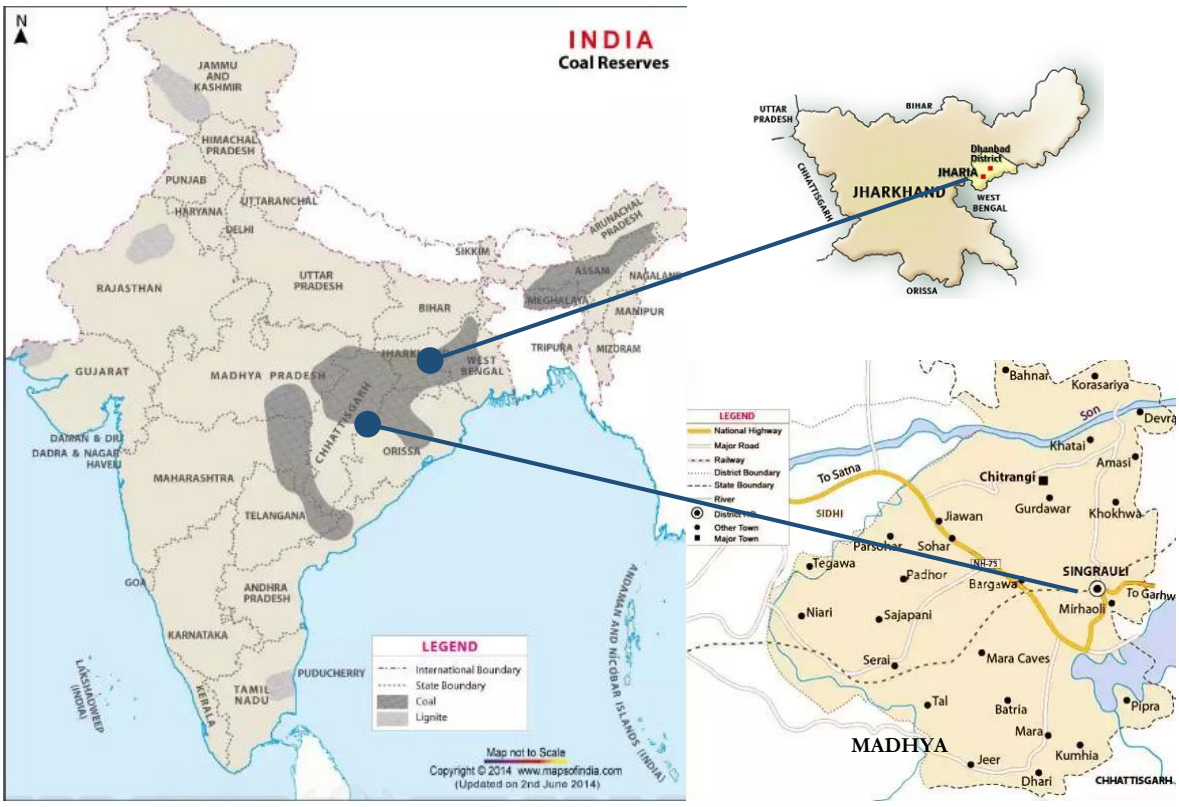


Figure 4.2.1 – Jharia and Singrauli

Source: im.hunt.in/cg/Singrauli/CityGuide/singu.jpg; www.mapsofindia.com/maps/india/india-map-coalreserves.jpg; http://topnews.in/law/files/jharkhand-map2_5.jpg

4.2.1 Location and context

Jharia lies in the state of Jharkhand, in the east of India. Jharkhand, which literally translates to 'forest track' is a forested state in the Chhotanagpur plateau. Jharia has a population of 475,341 people, and covers an area of 9077.15 hectares (http://dhanbad.nic.in/links/jharia.htm). Jharia is situated in the Damodar basin, one of the most important industrial and mining regions of the country, which contains vast reserves of coal (Areeparampil, 1996). The tribal people, known as adivasis, face land alienation and displacement as a result of mining activities. The refusal to recognize their rights has led to many struggles in Jharkhand against dams, coal mines and other so-called developmental activities (Sundar, 2005).

The Singrauli coalfield, on the other hand, spans across two states in central India – Madhya Pradesh and Uttar Pradesh. It consists of the Singrauli district in Madhya Pradesh and the Sonebadhra district of Uttar Pradesh. It has a population of 1,178,132 people and covers an area of 567,200 hectares (http://www.singrauli.nic.in/). Known as the 'energy capital of India' (http://www.singrauli.nic.in/) it contains sixteen mines between these states. Fifteen of these are run by the state-run company National Coalfields Limited, a subsidiary of Coal India. Singrauli at present accounts for ten percent of India's total national generating capacity, with an astounding 20 gigawatt energy capacity. Singrauli has become very

important as a coal source because India contains the fifth largest reserve of coal in the world. Also, India has very few sources of cleaner fossil fuels (Rose, 2015).

4.2.2 The story of Jharia

Jharia was once a dense forest with different tribal groups living in it. Coal mining started in the late 1890s in Jharia, turning it into a crucial source of coal for the growing steel industry in India. Jharia has a rich deposit of coking coal, which is used to produce steel. From the start, a good deal of the coal mined in Jharia has been used by TISCO (Tata Iron and Steel Company)/ Tata Steel Ltd. for steel production (Thakurta,; Prasad, 1986). The First World War saw a period in which every possible coal mine was being utilized to its fullest potential (Prasad, 1986). Presumably in the midst of this, in 1916, an improperly shut down mine started an underground fire that has ravaged the land these past 99 years, and still persists.

Figure 4.2.2 – People collecting coal in illegal mines in Jharia
Source: http://www.greenpeace.org/international/en/campaigns/climate-change/when-jozwin-met-jharia/blog/8898/

Following the nationalization of coal mining in the period 1970-1973, Bharath Coking Coal Limited (BCCL) was conceived. Before this, corruption and coal theft were seen as problematic and frequent occurences in the coal industry. BCCL is a subsidiary of Coal India Limited (CIL) which, as already mentioned, is a Central Public Sector Undertaking of the Ministry of Coal (MoC). Though it began with underground coal mining, BCCL eventually switched to open-cast mining. In effect, mechanization and nationalization in India reduced the demand for labour greatly. Underground mining is more labour-intensive, but is relatively less destructive of the surrounding land. Open pit-mining, on the other hand, causes irreversible pollution and damage to the land and ecosystem, but requires less labour.

Soon after its conception, BCCL plummeted financially and corruption and coal theft continued as before. These financial problems led to BCCL reducing its employee strength and salaries, which in tun increased unemployment in the area. Many mines closed down as well. As a fallout of increasing unemployment and mine abandonment, the youth of the region began to risk their lives to travel hundreds of feet underground in abandoned mines to obtain a little coal. They would then sell this coal for a very meagre sum of money every day to scrape a living (Lahiri-Dutt and Macintyre, 2006; Thakurta,). The Ministry of Labour and Employment (MoLE), through its CPSU the Directorate General of Mines Safety (DGMS) is supposed to ensure that regulations relating to mine safety are followed. In practice, this is not always the case. In *Inferno: Jharia's Underground Fires*, a documentary on Jharia (Thakurta, 2006), officials from DGMS mention that if the law were followed to the letter, mining would be impossible. They go on to say that mining is a 'constant fight against nature' and that laws simply need to be followed in essence. Perhaps this attitude is one of the reasons the quality of life in the mines is so poor, and mining accidents so common. Many miners don't have basic safety equipment, and are exposed to toxic fumes constantly, among other things.

The role of the MoEFCC with regard to forest land in such a scenario is clearly limited, since there is little forested land left in the Jharia coal field. Instead, through its CPSU, the Central Pollution Control Board

(CPCB) and the CPCB'S subsidiary, the Jharkhand Pollution Control Board, the MoEFCC has a role to play in monitoring pollution levels and environmental standards. Unfortunately, the regulating bodies and the industries often work hand-in-hand, with the former working with a bias in favor of developers (Lahiri-Dutt and Macintyre, 2006). In India, the equivalent of the concept of prior and informed consent is a public hearing under the Environmental Impact Assessment. However, this public hearing has no legal claim and the MoEFCC is not bound by its decisions. The 'mafia' or local informal leaders are wealthy individuals or networks that regulate the illegal coal mining activities in Jharia. They also often the police and other regulatory bodies, and have powerful political connections at different levels. Figure 4.2.2 describes the typical structure of small-scale supply chains for illegally mined coal.

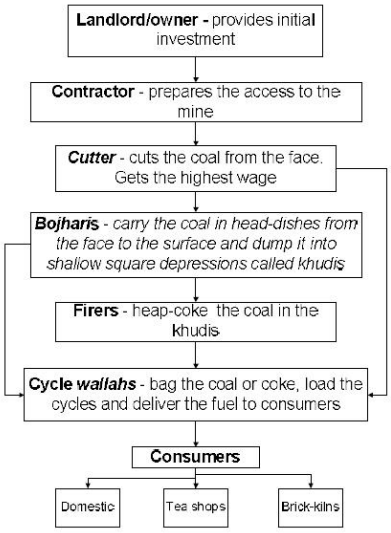


Figure 4.2.2 – Illegal coal mining cycle in Jharia
Source: http://www.eoearth.org/view/article/151277/

The World Bank has provided funds for expanding and increasing the efficiency of existing projects, as well as funding impact assessment projects aimed at fire control (http://www.worldbank.org/projects). Greenpeace India, similarly, has had more of an awareness-creation role in a reactive rather than proactive manner, since much of the damage to the ecosystem in Jharia has already been done. Greenpeace India does, however, still conduct documentation programs, create documentaries and reports as well as campaigns and petitions to help the thousands of people living amongst the burning fires of Jharia.

4.2.3 The story of Singrauli

Until the 1960s, though the land in Singrauli was by no means pristine, it still contained traces of forest cover and measurable biodiversity. The local (human) inhabitants were mainly tribal groups who practiced traditional subsistence agriculture (Rich, 1994). In 1962, Jawaharlal Nehru, the first prime minister of India, inaugurated the Rihand Dam, one of the proposed "temples of modern India". This began a "systematic appropriation of prime agricultural land" (International Accountability Project, as cited in Greenpeace, 2011). As Rich (1994) remarks, however, "the planners and financiers of what Nehru called the Switzerland of India forgot two things: the people who lived there and the very existence of the land, air, and water except as abstract industrial inputs".

Figure 4.2.3 –Trucks carrying coal in a mine in Singrauli
Source:http://www.theguardian.com/news/2015/may/27/why-india-is-captured-by-carbon;

The World Bank provided the Government of India with the initial funding to transform Singrauli into a major coal-producing area. In 1977, the World Bank provided NTPC with (dollar symbol) 150 million initial funds to finance the Singrauli Super Thermal Power Plant (SSTPP). It provided further funds in 1980 to finance the expansion of the SSTPP. After this, in 1985, the Bank provided financial assistance to start one of the first open-pit coal mines in the area – Dudhichua (Greenpeace, 2011). Dudhichua produced 15 million tonnes of coal between March 2014 and 2015 alone, and now covers a surface area of 16 square kilometers (Rose, 2015). In total, the World Bank contributed about $850 million towards the development of the Singrauli area. These initial investments attracted more investors – from Germany, the UK, Japan, France and the (former) Soviet Union.

Though the Indian government, NTPC and Northern Coal Limited (NCL) were primarily responsible for the commencement of mining activities in Singrauli, the World Bank was an important catalyst in supporting many of these projects. It also played in an important role in helping some of the key borrowing agencies in Singrauli in their developmental years. India was one of the most important borrower countries for the World Bank, with the NTPC borrowing over $2.6 billion in its first decade of existence (Rich, 1994). The Ministry of Power is the governmental body responsible for policy and action in the field of energy. It is the parent organization of NTPC (http://powermin.nic.in/). The National Thermal Power Corporation (NTPC) was set up in 1975 as a Central Public Sector Undertaking under the MoP, shortly following the nationalization of coal mines in India. In 1977, the Super Thermal Power Project in Singrauli, Uttar Pradesh, was given clearance by the Government of India (http://www.ntpc.co.in/). Its first loan (GBP 298.41 million) was from a consortium of foreign banks under Standard Chartered Merchant Bank for the Rihand Dam project. As previously mentioned, NTPC also received a great deal of funding from the World Bank in its initial phases, as well as for its initial projects. The MoC is the governmental body in charge of allocating (now through auction) coal blocks - portions of land identified as having mineable coal deposits. The Ministry of Environment, Forests and Climate Change (MoEFCC) has the authority to allow or prevent forest clearance, through the Forest Conservation Act (FCA), 1980[2].

[2] It is important to note, however, that the FCA, which is supposed to protect forest rights, is more often than not used as a formal procedure to obtain permission for forest clearance.

If a company wishes to mine in a forested land identified as a coal block by the MoC, the MoEFCC must grant permission for forest clearance before mining may proceed. Thus, as far as land for mining is concerned, the MoEFCC and the MoC must be in agreement over the granting of land for clearance and subsequent mining. Among the prominent mining companies are PSUs such as Coal India Limited, and private companies such as Essar, Hindalco (from the Aditya Birla Group), Reliance, the Jaypee Group, and others. They operate (or seek to) in different coal blocks within the Singrauli region. Coal India Limited (CIL) is a Central Public Sector Undertaking by the Ministry of Coal. It is currently the largest coal mining company in the world. In the Singrauli region (in both the states of Madhya Pradesh and Uttar Pradesh), it operates under its subsidiary, Northern Coalfields Limited. The different mining company stakeholders often mine under joint ventures, and use the coal mined to feed their respective thermal power plants. The coal mined in Singrauli is primarily used for the purposes of power generation.

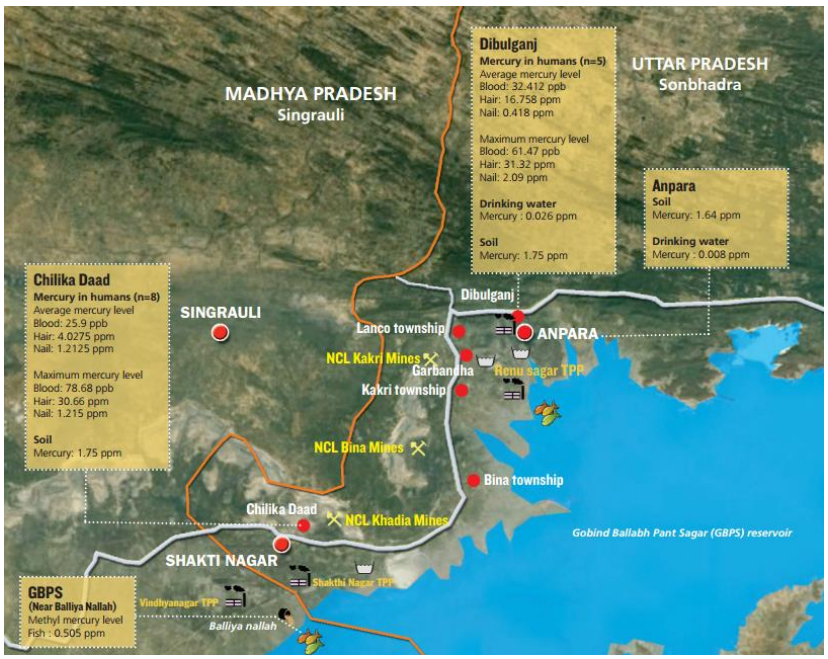
Presumably since the activities in Singrauli are ongoing and there are yet forests to be cleared for mining, proactive activism has been quite an important factor. The proposals and opposition to clearing the Mahan forest have received much attention in recent years, and are ongoing battles. Among the various NGOs crusading for the rights of the people and forests, Greenpeace India been of prominence at the national level. They have published reports and documentations through fact finding teams, apart from actively campaigning through petitions that reach out to both the general public as well as important decision makers. Greenpeace India's efforts perhaps gained the amount of publicity they did because of Greenpeace's prominence and reputation in the international circle. However, there have been other groups working at the local level as well. These include the Mahan Sangharsh Samithi (MSS) and Srijan Lokhit Samithi (SLS) and other individual activists (Greenpeace, 2011; https://lokhitsamiti.wordpress.com/).

The campaigners for the protection of the Mahan forest were aided by the (former) Minister of Environment and Forests - Jairam Ramesh. Though the Ministry did not vehemently oppose the proposal initially, it did eventually seek to stop it. In the year 2010, the MoEFCC published a 'no-go' list of forest land that could not be mined for coal (Greenpeace 2011). The Mahan Coal Block was among those put under this list, thus putting a hold on Hindalco and Essar's plan to mine for coal and generate power through their joint ventures – Mahan Power Plant and Mahan Coal Limited (Greenpeace, 2011). Ramesh also sought to use his position as environmental minister to negotiate with the authorities of Hindalco, Essar, the Minister of Coal, and other governmental heads, to leave Mahan forest intact. One of his noteworthy arguments was the fact that an irreplaceable sal wood forest was being destroyed for a mining project whose lifespan was only 14 years. In March of 2015, years of campaigning resulted in mining being banned in Mahan forest (www.rtcc.org, March 25, 2015). However, with the introduction of the new Coal Mines (Special Provisions) Act, 2015 which in many ways eases the process of mining, the future of the Singrauli region remains uncertain.

4.2.4 Other impacts of mining

Jharia has had over 70 coal fires burning since 1916, which emit poisonous gases such as sulphur, carbon and nitrogen dioxides continuously (http://www.singrauli.nic.in/; Schiller, 2015; Stracher, 2010). The land, which was once dense forest, is now a burning pyre. The polluted air causes a plethora of problems to the ecosystems, as well as health problems to the people living there. The hundreds of thousands of people living in Jharia are yet to be relocated. It is questionable how many of them would be willing to leave their ancestral lands, however, even if they were given the option to. Many collileries and industries release effluents into water bodies such as the Damodar River (Singh J 1985:217, cited by Areeparampil, 1996).

Mercury poisoning is one of the most devastating effects of coal mining in the Singrauli region. Mercury vaporises during the combustion of coal and is released into the air along with fly ash and other by-products of coal mining and coal-based energy generation. An Electricité de France study, according to the Blacksmith institute, showed that thermal power plants in Singrauli release 720 kg mercury yearly. This report also shows that coal combustion releases six million tons of fly ash into the air yearly, which settles onto the land and makes it uncultivable (Greenpeace, 2011; Blacksmithinstitute.org, n.d.). As most coal blocks are located in forest land, including those in Singrauli (Sharma and Singh, 2009), irreparable damage is done to all facets of the ecological systems in the area. Mercury seeps into the air, water and land, enters the bloodstream and causes chronic illness and death. Northern Coalfields Limited (NCL)'s overburden (waste) washes down into villages and their surrounds during monsoon season, polluting the land (Juneja, 2012). The report by Juneja goes on to say:



"The Central Pollution Control Board analysed 11 coal samples from Singrauli and found mercury concentration in coal ranging between 0.09 parts per million (ppm) and 0.487 ppm. In 2011, Delhi-based non-profit Centre for Science and Environment (CSE) had found 0.15 ppm mercury in coal at Anpara village in Sonbhadra. It is estimated that a 1,000 MW thermal power plant is emitting at least 500 kg of mercury every year in Singrauli."

Source: (http://www.cseindia.org, 2012)

The Centre for Science and Environment published a study in October 2012 stating that drinking water in certain villages contained 26 times more mercury than permissible (by the Bureau of Indian Standards) for human consumption. Further, due to bio magnification, animals drinking from polluted water sources were also found to contain high levels of mercury in their bloodstreams (Katakey and Singh, 2014). Unfortunately, as Katakey and Singh point out, little action seems to have been taken regarding this.

5 RESULTS AND DISCUSSION

In this Chapter, the two case studies will be compared using three perspectives – actor mapping, policy analysis and finally, analysis of the actors' understanding of the concept of 'nature' and perception of environmental risk. Actor mapping, which comes in handy while examining and comparing actor types, positions and linkages. The actors are displayed on various broad levels, and coded with color and shape, to deepen the analysis. The policy analysis looks at linking different governmental actors to the policies and acts related to coal mining and forests. This thus seeks to reveal which ministries have the most stake as per the institutional framework within which they perform actions. Finally, the third section will use the inferences from sections 5.1 and 5.2 to glean an understanding of how different actors in this action arena understand the concept of 'nature' and perceive environmental risk.

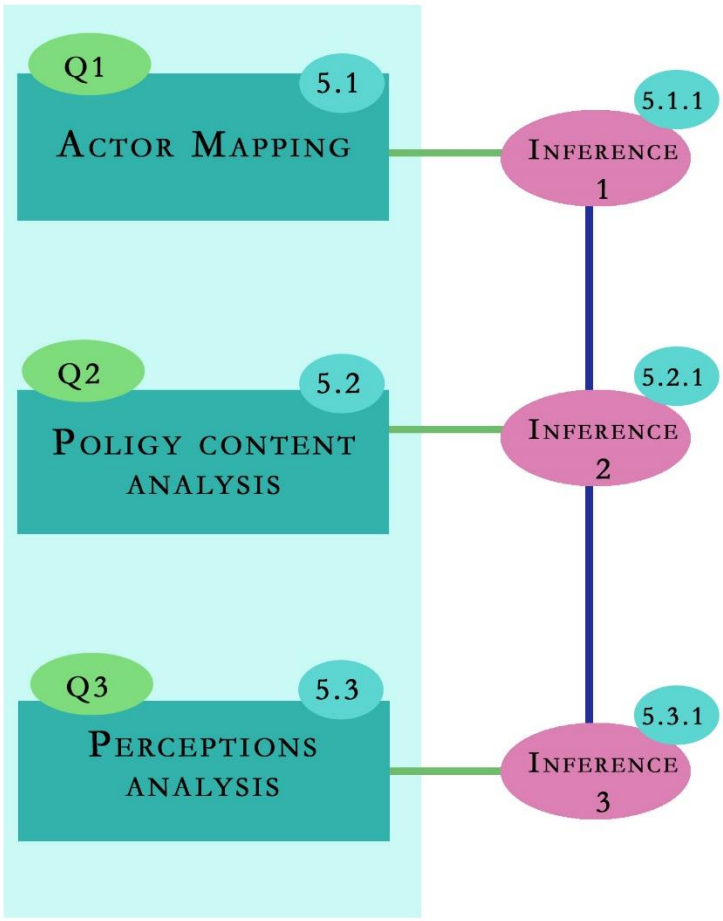


Figure 5.0 – Layout of Chapter 5

5.1 Actors and positions

Actor mapping is a useful tool to examine actor types, positions and linkages, and compare them. The maps below depict the different actors involved and their positions with respect to four levels – district, regional, national and international. As is often the case, some actors function across levels while others are more specific to a level. The color-coding shows the broad field of activity (steel, power, etc.). The shape shows the type of body (NGO, governmental, etc.) The arrow types indicate nature of association, as explained in the key. The two cases are compared in the subsequent section.

5.1.1 Actor maps

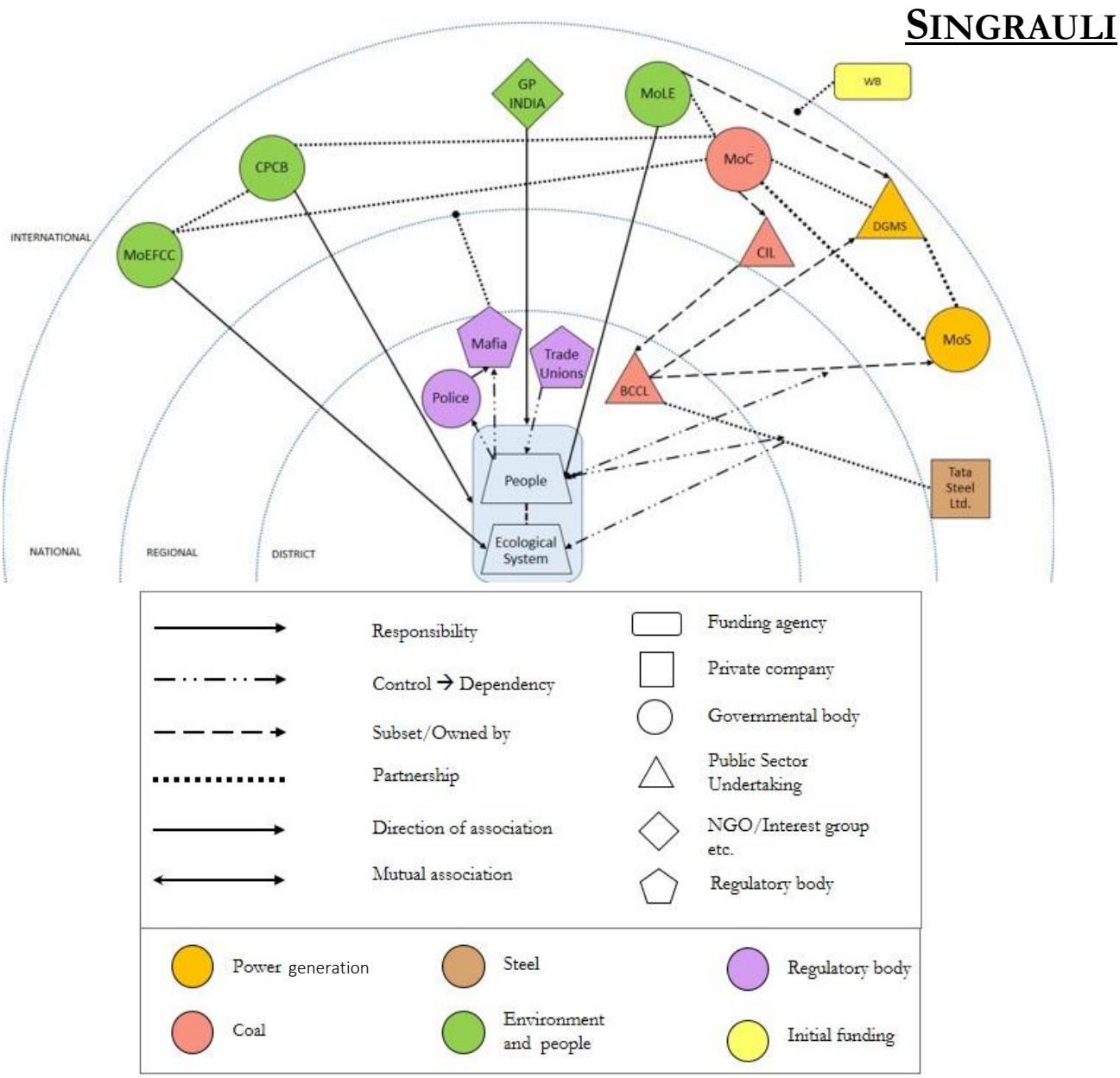


Figure 5.1 – Actor map of Singrauli

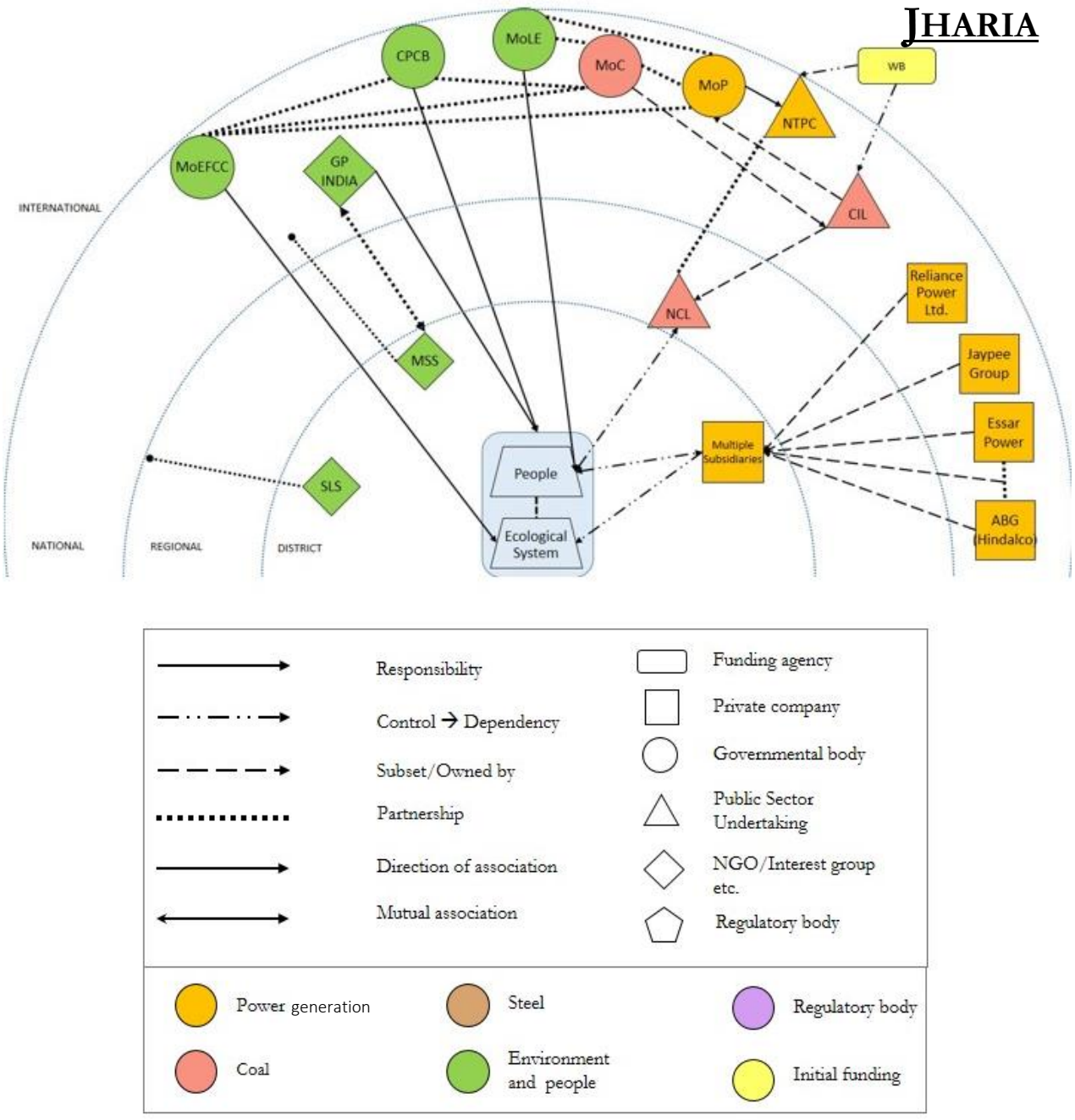


Figure 5.2 – Actor map of Jharia

5.1.2 Analysis

In both Singrauli and Jharia, the World Bank is an actor at the international level. However, the nature of interaction is different – in Singrauli, the World Bank has a control-dependency relationship with the National Thermal Power Corporation (NTPC) and Coal India Ltd. (CIL), whereas in Jharia, it has a partnership association with the broad national level.

At the national level, it is seen that the MoLE, MoC, P and MoEFF are present in both cases with the same linkages. The MoC is linked to the MoLE and MoEFF with 'partnership' linkages. While the MoP is an important actor in Singrauli, the 'energy capital of India', the MoS is of significance in Jharia, the 'coal capital of India'. In both cases, the MoC has partnership linkages with the MoP and MoS respectively. Another common feature in both cases is the MoEFCC - CPCB - MoC triangle. The CPCB is a statutory

body under the Water (Prevention and Control of Pollution) Act, 1974, which functions under the Air (Prevention and Control of Pollution) Act, 1981.

Coal India Limited (CIL), which is a public sector undertaking of the MoC, is present in an important position in both cases. In Singrauli, it operates through its subsidiary Northern Coalfields Limited (NCL) whereas in Jharia it operates as BCCL (Bharat Coking Coal Limited) at the regional and district levels. Since Singrauli is predominantly an energy producing region, NCL and the power company National Thermal Power Corporation (NTPC) are seen to be associated. This is also for the reason that power generating companies are often positioned close to coal mines, in order to increase efficiency and reduce transportation cost. NTPC is a public sector undertaking of the MoP. In Jharia, on the other hand BCCL, the main coal mining company, has 'partnership' linkages with Tata Steel Limited. Tata Steel Limited is a private Indian steel manufacturing giant. It is interesting to note that while in Singrauli, there are multiple private mining companies, both national and international (some forming joint ventures), Jharia is mainly mined by the State-run BCCL. In both cases, the MoEFCC, CPCB and MoLE are shown as having 'responsibility' associations with some component of the social and ecological system. The MoLE, or Ministry of Labour and Employment, deals with safety and labour rights. It operates through its public sector undertaking, the DGMS or Directorate General for Mines Safety.

Greenpeace India is functional from the national level in both cases, working with district-level interest groups and NGOs such as MSS in Singrauli. At the district level in Singrauli, two groups in particular, SLS and MSS, seem to be particularly active[3] in representing local causes to other (national and regional) levels. In Jharia, the relationship between the people and the local 'mafia' appeared to be quite significant, and has been shown in the actor map as well. The local people as well as the police, in some measure, are dependent on the mafia in terms of local informal institutions that dictate their livelihood and survival.

Local tribal/non-tribal people living in and around the forests share a mutual interdependency with mining companies in both instances. This is for the reason that mining companies have the ability to determine thenature and extent of their mining activities, and also the labour that they employ. Thus, in determining the extent of how they affect the local SESs (whether or not they mine, for instance) as well as in determining their fate after mining activities commence, the mining companies have a critical role to play across levels. When mining activities do take place, the mining companies require labour – often inexpensive and unskilled for temporary jobs – and are thus dependent on locally available human resources. Furthermore, they are heavily dependent on the forests for water, raw material for mining and refining, and on the land for the coal itself.

5.1.3 Inferences

The actor maps indicate that the two cases are similar at the national level in terms of types of governmental actors and linkages. Indeed, many of the governmental actors at the national level are the same. At the district level, however, Jharia has the added element of the presence of the 'mafia', which changes the dynamics at this level. Also an important difference between Jharia and Singrauli is that in the former, the mining is performed primarily by a single company, which is state-run. In Singrauli, there are many mining companies, and the state run NCL is only one of them. There is a strong international presence in Singrauli, which is absent in Jharia. Another thing that is strikingly apparent from the actor maps is there is a strong centralized governance tendency. Most of the key actors are present at the national level, and many of these are governmental bodies. It is also curious to note that most of the arrows point from the national level to the district level, indicating a very top-down mode of governance.

[3] This is inferred from the data available. Though there are undoubtedly more groups working in these regions than shown, the actors appearing to be most active and significant have been shown.

5.2 Institutional analysis

The table below links different governmental actors to policies and acts pertaining to coal mining and different components of the non-human and human components of forests. This provides an understanding of which ministries have the most stake as per the institutional framework within which they perform actions. The institutional framework in essence dictates which actions are allowable, mandatory or forbidden, and essentially provides them with a set of possible actions (Ostrom, 2005). From the table, it is clear that a majority of the policy frameworks are associated with the Ministry of Environment, Forests and Climate Change (MoEFCC), followed by the Ministry of Mines (MoM).

Policy	Forest Rights Act, 2006	National Green Tribunal Act, 2010	Environmental Impact Assessment Act, 2006	Forest Conservation Act, 1980	Water (Prevention and Control of Pollution) Act, 1974	Environment Protection Act, 1986	National Forest Policy, 1988	Wildlife Protection Act, 1972, Amended 2006	National Environment Policy, 2006	Air (Prevention and Control of Pollution) Act 1981	Coal Mines Special Provisions Act, 2015	Mineral Conservation and Development Rules, 1998	National Mineral Policy 2008	Mines and Minerals (Amendment) Act, 2015	PESA 1996	RFCTLARR (Amendment) 2015
Ministry of Environment, Forests and Climate Change	■	■	■	■	■	■	■	■	■	■						
Ministry of Coal											■					
Ministry of Steel												■				
Ministry of Power																
Central Pollution Control Board					■	■										
Directorate General of Mines Safety																
Ministry of Labour and Employment																
Ministry of Mines											■	■	■	■		
Ministry of Panchayati Raj															■	
Ministry of Rural Development																■

Table 5.1 - Governmental bodies and the institutional framework

Table **2** shows a content analysis of the policies listed in Table 1 listed in descending order of occurrence. A second level of analysis was done to differentiate positive, negative and neutral impacts for the SESs being studied. The dark green boxes indicate a clear positive mention (in other words, the policy favors the protection of that particular aspect of SESs), while the yellow boxes indicate a negative mention (the policy does not favour the protection of that particular aspect of the SESs, and in fact may be detrimental to their integrity). The light green boxes indicate neutrality. This was used whenever it was not possible to determine a clear positive or negative impact, often the case when it is only in the manner of implementation of a policy that its impact can be determined.

Aspect	Environmental Impact Assessment Act, 2006	Mines and Minerals (Amendment) Act, 2015	Mineral Conservation and Development Rules, 1998	RFCTLARR (Amendment) 2015	National Green Tribunal Act, 2010	PESA 1996	Forest Rights Act, 2006	Forest Conservation Act, 1980	National Forest Policy, 1988	Environment Protection Act, 1986	Water (Prevention and Control of Pollution) Act, 1974	National Environment Policy, 2006	Wildlife Protection Act, 1972, Amended 2006	Air (Prevention and Control of Pollution) Act 1981	Coal Mines Special Provisions Act, 2015	National Mineral Policy 2008	Number
Affected people																	7
Mining																	3
Land acquisition																	3
Land alienation																	2
Tribal rights																	4
Forest clearance/diversion																	4
Tree-felling																	3
Environmental protection																	7
Air pollution regulation/control																	5
Water pollution regulation/control																	5
Non timber forest produce																	3
Infrastructure and development																	3
Minerals																	2
Mine operation																	1
Duties of skilled employees																	1
Env. Impact assessment																	1
Rehabilitation																	1
Land degradation																	2
Mining lease																	2
Auction of mines																	2
Mining area limit																	1
Gram sabha																	1
Self-governance																	1
Dereservation of forest																	1
Forest village																	1
Lease restriction																	1
Wildlife																	2
Protected area																	2
Coal																	2
Traditional knowledge																	1
Natural heritage																	1
Climate change																	1
Biodiversity																	1
Compensation and relief																	1
Project expansion																	1
Coal block allocation																	1
Coal mines																	1
Mine monitoring																	1
Employment																	1
Environmental clearance																	1
Sanctuary																	1
Tiger protection																	1
Wildlife crimes/punishments																	1
Zoo																	1
Forestry																	1
Forest management																	1
Social impact assessment																	1

Table 5.2 - Content analysis of relevant policies

5.2.1 Inferences

From Table 5.**2**, it is evident that 'affected people' and 'environmental protection' are frequent themes, although not always in a manner that safeguards forest social and ecological systems. Apart from these, the rights of tribal populations, pollution and deforestation (forest clearance) are frequent themes. More often than not, 'affected people' include tribal populations. Thus, there is clearly a reasonable amount of emphasis on ecological preservation and tribal populations.

It was interesting to note during the content analysis of many of the forest or environment-themed policies, such as the Wildlife Protection Act, 1972 and the National Forest Policy, 1988, that there is a clear emphasis on preservation and protection from the point of view of human well-being and possible future value of ecosystems and species. The PESA, 1996 emphasizes the rights of indigenous populations with the underlying theme of tribal self-governance. The Forest Conservation Act of 1980 and the Forest Rights Act of 2006 also emphasize the tribal rights angle favourably. However, the National Forest Policy, 1988 is less evident in its favour. Overall, the PESA, 1996, Forest Rights Act, 2006, and Forest Conservation Act, 1980 appear to be most favorable towards the preservation of the SESs. On the other hand, the Coal Mines Special Provisions Act, 2015, is highly unfavourable. As it has only recently been passed, it remains to be seen just how adverse its impact is.

Three clusters can be made based on the added dimension of policies with groups of common themes. The first cluster contains policies that speak about affected people. Some of these additionally mention mining. The policies in the first cluster are the Environmental Impact Assessment Act, 2006, Mines and Minerals (Amendment) Act, 2015, Mineral Conservation and Development Rules, 1998, RFCTLARR (Amendment) 2015, National Green Tribunal Act, 2010, PESA 1996, and Forest Rights Act, 2006. In the second cluster, the PESA 1996, Forest Rights Act, 2006, Forest Conservation Act, 1980, and National Forest Policy, 1988 are seen to have the common themes of land acquisition, land alienation, tribal rights, forest clearance/diversion, and tree-felling. Finally, in the third cluster, the National Forest Policy, 1988, Environment Protection Act, 1986, Water (Prevention and Control of Pollution) Act, 1974, and National Environment Policy, 2006 are seen to discuss the themes of environmental protection, air pollution regulation/control, water pollution regulation/control and non-timber forest produce. Comparing the clusters in Table 5.2 with actors in Table 5.1, it is observed that some of the actors in cluster 1, most of the actors in cluster 2, and all of the actors in cluster 3 are the MoEFCC. It is interesting that despite the dominance of the MoEFCC, the forests and people are in their present pitiable state. This raises the question of whether there is a lack of implementation of policies, or excess of vested interests, and whether regardless of theme and topic, the influence of each policies differs, thereby giving minority actors more power.

Apart from observations regarding frequent themes, it is noteworthy that certain themes appear to be almost non-existent. Furthermore, these are themes that are highly pertinent to SES protection. These include climate change (which is interesting considering that the environmental ministry is called the Ministry of Environment, Forests and Climate Change), biodiversity, environmental clearance, wildlife crimes, land degradation, environmental impact assessment under ecological aspects. Relating to more social aspects are the themes of '*gram sabha*' (which is the smallest unit of governance – village assembly) compensation and relief, social impact assessment, self-governance and social impact assessment. The themes of traditional knowledge and natural heritage, which are more inclusive of social and ecological systems together, are also mentioned in only one policy each.

5.3 Perceptions of nature and environmental risk

As a last step to this three-fold analysis, this section will use the inferences from sections 5.1 and 5.2 to glean an understanding of how different actors in this action arena understand the concept of 'nature' and perceive environmental risk. Of course, this understanding is subjective to this situation since the actors in question are not individuals with agency but rather organizations that are often constrained by the institutional framework within which they must operate. This means that there are times when an individual leading an organization or a group within the organization may not agree with the action path chosen by the organization, but lacks the ability to direct it otherwise. In any case, it is useful to extrapolate an essence of the different actors' perceptions of nature and environmental risk. This will make it easier to understand the motivations behind different actions which ultimately result in the outcomes (effects on social-ecological systems) that are seen. Figure 5.3 shows the actor types placed on the spectrum explained in Section 2.1.1 in Chapter 2. The actors have been classified on the spectrum of nature perceptions, with the added dimension of environmental risk perception.

Although the function of the government is fundamentally to look after the interests of people, there is an evident split in the interests of the ministries, even on paper. The Ministry of Coal, Ministry of Steel and Ministry of Power are very clearly economic-development oriented. The others, such as the Ministry of Forests and Climate Change, the Ministry of Labour and Employment and so on are more difficult to place. The MoEFCC, for instance, could be placed at different points on the spectrum in different situations. In the case of Singrauli, there have been instances when the MoEFCC has advocated highly in favour of the people and forests of Mahan. At present, the same ministry is looking to expedite forest clearance (Mazoomdar, 2015).

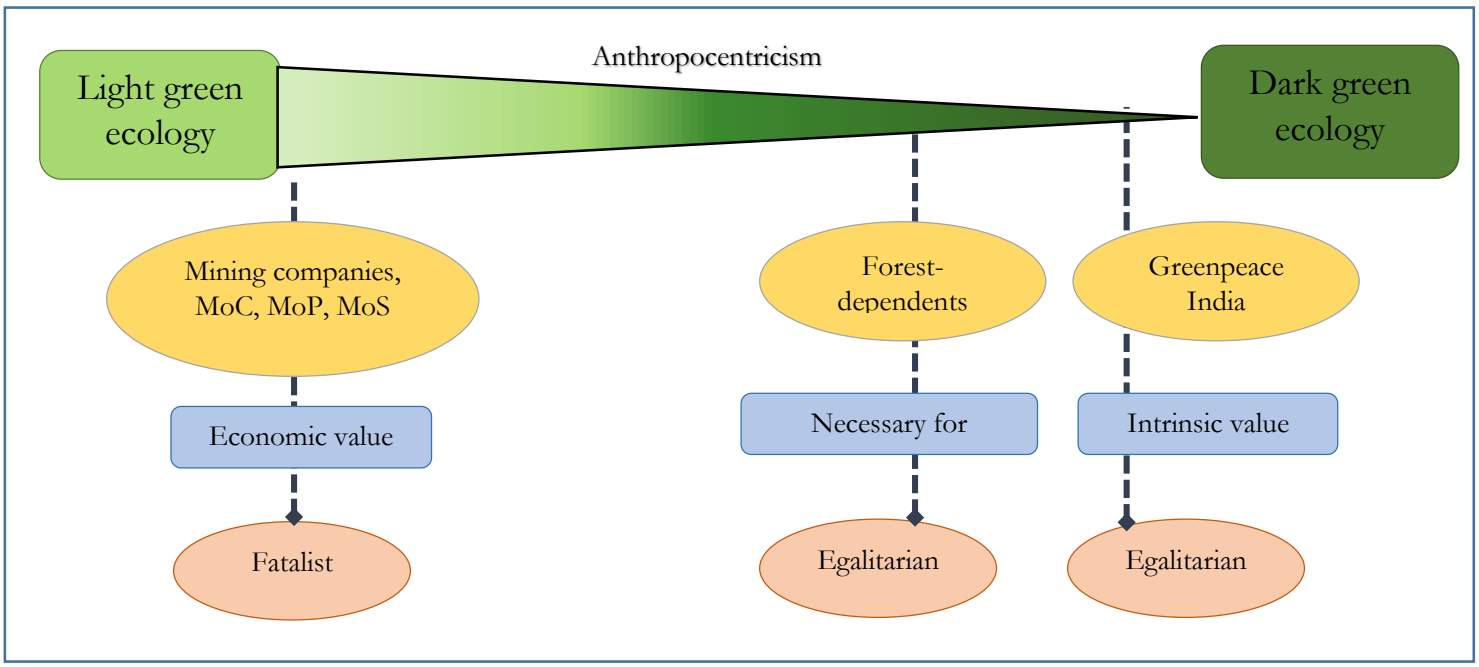


Figure 5.3 - Actors' perceptions of nature and environmental risk

With mining companies, it is fairly evident that interests are economically oriented. Their risk perception is closest to the *fatalist* (nature capricious) type, and their perception of nature is quite on the shallow ecology end of the spectrum. NGOs such as Greenpeace India which seek to protect SESs may be termed as *egalitarian* (nature ephemeral) in their environmental risk perception, since they seek to control resource exploitation. Egalitarians, as described in Chapter 2, consider needs to be controllable, and resources to be finite. Greenpeace India would likely fall under the mid- to deep-ecology portion of the spectrum, as it advocates for the rights of human beings as well as non-human nature. Other NGOs that advocate solely

for the rights of the people, such as Mahan Sangarsh Samiti, are more likely to fall under the light to mid-green portion of the spectrum. The tribal and non-tribal people living in and around the forests are quite interesting to consider, because their cultural beliefs, which typically consider the forest to be their mother, place them at the dark green end of the spectrum. This is interesting to note because these cultural beliefs are invariably the result of generations of managing to live harmoniously with the forest, since survival would not have been possible long-term if they had not managed to do so. Thus, their environmental risk perception is also likely closest to the *egalitarian* (nature ephemeral) type, since their cultures are almost always built around consuming only as needed, and replenishing as possible[4].

5.3.1 Inferences

When the perceptions of nature of the different actors are compared, it is observable that the more economically oriented ones are also not directly dependent on or associated with nonhuman nature. International mining organizations, for instance, do not depend on forests for water, food and protection. They do not directly perceive the effects of the destruction of a forest either, since they are so far-removed from them. Ministries as well, despite having much easier access to forests, are in no way directly dependent on them. In essence, apart from those who live in and around forests, and NGOs and interest groups that have taken a conscious interest in forests and people, the other actors are in no way associated with the forests apart from the fact that it contains coal reserves. Their only short term gain from the forest is its resources. This is reflected in their actions as well. Furthermore, they are much less vulnerable to change than those who live in and depend on forests. Thus, their concern for these systems also appears to be very meagre. On the other hand, those who live in and depend on forests are much more vulnerable to disturbance if their support system, the forest, is removed. Their weak economic status and lower access to information beyond the reaches of their spheres increases their vulnerability to both human manipulation and environmental disturbances. It is therefore inferable that closeness of association with non-human nature, vulnerability both economically and physically, and degree of direct dependency on nonhuman nature are proportional both to environmental risk perception as well as perception and valuing of nonhuman nature.

[4] Refer to Chapter 4, Section 4.1.

6 CONCLUSION

At the outset of this research, three questions were asked in order to address a broader question regarding the effect of coal mining on social-ecological systems in Indian forests. In the course of this thesis, these questions have been delved into through actor mapping, institutional analysis and an analysis of nature and environmental risk perceptions. The final chapter of this thesis will attempt to summarize the findings of this research and what it means, and point the way for future study.

6.1 Specific questions:

6.1.1 Question 1: Actors and positions:

Who are the actors at play, and what are their positions? How do they interact in the coal mining action arena?

Through the actor mapping, it is apparent that there are many similarities as well as differences between the two cases. The interplay of several social, economic and political interests leads to interesting scenarios. The complexity of the issues, with multiple levels, multiple actors and interests, makes them all the more challenging to tackle. An important conclusion is the predominance of national level – in both cases, national-level governmental actors and linkages and many of the governmental actors are in fact very similar. Additionally, it has become apparent that there is a rather centralized mode of governance, since the decisions are seen to be made at the national level and implemented on the forest systems. There is a top-down decision making process in both instances. This is sad and ironic, considering that acts such as the PESA, 1996 emphasize tribal self-governance and participation in decision-making processes. This once again reinforces the need for inclusivity in landscape governance, discussed in Section **2.3.2**.

In India, infrastructure planning processes tend to take on a reductionist view that does not give much credence to social and ecological impacts (Kothari, 1996). Often, environmental impact assessments and social impact assessments, if done at all, are eyewash. Corporations may have the power to exert influence on policy-making processes, and the power to bend the rules. This means that formal procedures may easily be overlooked (Lele and Menon, 2014). Further, the economic justifications given for destruction of social-ecological systems depends on a reductionist, economic cost-benefit analysis. These "devalue or ignore basic socio-cultural and ecological processes" (Kothari, 1996). In any case, how does one quantify and attach quantitative value to intangibles such as risk perception, feeling of security, fear, and so forth? Or, similarly, to a forest or a tree? Even from a purely anthropocentric point of view (discussed in Section **2.1.1**), it is difficult to assign value to natural elements when one does not know how useful they might prove to be in the future. Aside from this, however, it is impossible and ludicrous to attempt to assign numbers to abstract aspects and effects of coal mining. Cost-benefit analyses force social and ecological intangibles to be examined under the lens of the market framework, which is fuelled by vested interests. The ability of the central government of a sovereign state to exert its power of eminent domain is often misused to their unfair advantage. It is used to impose "developmentalism, without restoring meagre sources of sustenance of the affected people" (Sharma, 2010).

6.1.2 Question 2: Institutional framework:

How does the institutional framework influence the state of these socio-ecological systems and the actions of the actors?

The policy analysis has revealed certain systemic issues in the policy framework that leads to certain outcomes for SES conservation. The main issues with the policy framework are of fragmentation, and skewed policy interests. Table 2.2 showed that although frequent themes related to affected communities and 'environmental protection', they are not always mentioned in a manner explicitly seeking to safeguard social and ecological systems. Thus, despite the apparent emphasis on ecological preservation and tribal populations, the manifestation of this emphasis is clearly unsatisfactory in reality. Another interesting fact

brought to light was the apparent stake of the MoEFCC, both in policy and frequently occurring themes in the clusters.

As far as the human-nature relationship discussed in Section **2.2** goes, it may be concluded that forests are cultural landscapes. In accordance with Kirchhoff, Brand and Hoheisel (2012), the perception of forests as far as the tribal communities goes is aligned with cultural landscapes being defined as "landscapes shaped by traditional forms of land use that are valued as putatively representing the result of a harmonious and unique human-nature relationship. In Section **2.3.2**, a discussion was presented regarding the consideration of landscapes as impure public goods (Gugerell and Roither-Voigt, 2014). Forests may indeed be considered cultural landscapes[5], although in this context they are not exactly impure public goods. Forests in India come under State jurisdiction, and although tribal customary rights over the land are often made to give way for 'national development', reminiscent of the Nehruvian model of governance discussed in Section **1.1**, they are not *owned* privately, nor are they private goods. However, they are similar to the impure public goods in that customary tribal rights to the forest land may be curtailed to cater to 'public interest', which is more often than not eyewash for political and private interests.

Drawing further from the conclusion in the previous passage regarding the centralized governance structure in this context, it may be inferred that there is a clear need for inclusive governance (Section **2.3.2**) here as well. However, in reality, there is already a provision in the policy framework for sharing of governance. The PESA, 1996 focuses on tribal self-governance and inclusion in decision-making processes, though it has not been assimilated and implemented. In totality, there is a clear lack of holism in the policies despite the presence of themes pertinent to the safeguarding of forest SESs. Governmental ministries vary in their jurisdictions, and thus there is a lack of consensus and working together, as is discussed in subsequent paragraphs.

Lack of holistic policies

There is a major institutional handicap seen in India with respect to inter-ministerial coordination. Affected communities do not experience problems in distinct categories such as 'water', 'energy', etc. They experience them in the interconnected way in which they exist in reality. Ministries, on the other hand, exist as separate nearly unrelated bodies that do not function together. The consequences of this are of course, ultimately felt by those affected by the mining processes in the first place. Even when attempts are made for the ministries to function together, conflict between departments inevitably follows because of differing interests (Kothari, 1996). For instance, the Ministry of Environment and Forests must give forest clearance for setting up new coal blocks. However, it is the Ministry of Coal that independently allocates coal blocks through auction. The effect of this lack of integrated allocation was seen when the Ministry of Environment and Forests denied clearance for the Mahan coal block, which the Ministry of Coal had allocated to Essar Energy and Hindalco Industries Ltd.

Policy and legal frameworks

Issues arise at the institutional level in part because of the failure of extant legal frameworks to perform their function of safeguarding the interests of the people. Instead, the tragic reality is that they are manipulated to better the interests of the wealthy, and to further impoverish the poor. This occurs for two main reasons – lack of/ poor implementation of existing policies, and inadequacy of the policies themselves. Though many exist pertaining to mining, forests and people, the FRA (Forest Rights Act), FCA (Forest Conservation Act) and PESA (Panchayat (Extension to Scheduled Areas) Act) are of crucial importance. However, many-a-time, these simply serve as means to officially approve forest clearance. This has been the fate of the Forest Conservation Act. Since its passing in 1980, at least 5,872.18 hectares of forest land have been officially diverted for other use. This figure does not indicate the extent of the land that has been cleared for industrial expansion post-approval. The PESA, in particular, is supposed to safeguard the rights of indigenous forest communities.

[5] Refer to Section 2.2.2, Section 2.2.3, and Section 4.1

PESA, 1996

The Panchayat (Extension to Scheduled Areas) Act of 1996, known as a Constitution within a Constitution, was a marked departure from any Acts that had been previously passed. It recognizes the Gram Sabha, the lowest unit of self-governance in a village, as preeminent and competent to act on preventing land alienation in Scheduled areas, regulating minor forest produce ownership, controlling local plans and resources and other such issues. It encourages an organic self-governing community instead of an administrative unit like the village, declares communities competent to safeguard and preserve their culture and tradition, exercise command over natural resources, maintain ownership of minor forest produce and manage dispute. It was created to shift the balance in power and empower the marginalized sections of society, protecting them from age-old bureaucratic elitist control. One of the fundamental problems with respect to the actualization PESA is the lack of meaningful adoption and implementation by the different states. Different states, in their state forest policies, have adopted PESA to varying degrees, but none in totality, and none to adequately empower the marginalized indigenous population, as was originally envisioned in the PESA (IRMA, 2010).A further detriment to the effective practice of the Act is the community's lack of adequate information. Though PESA envisaged a shift in the power balance "from the state apparatus and from economic and political elites, to the community", this has not yet been possible. Apart from this is the fact that the state apparatus and elites have essentially, through "legal and administrative subterfuge", has prevented any meaningful change from occurring.

6.1.3 Question 3: Nature and risk perception:

What can be inferred about the actors' perceptions of nature and environmental risk from their positions and actions?

The diversity of worldviews of the actors is rather telling of the reason for their divergent interests and eventually, clashes. The spectrum of perceptions seen is wide, even within the limit of important actors – not considering smaller actors. When the perceptions of nature (discussed in Section **2.1**) of the different actors are compared, it is observable that the more economically oriented ones are also not directly dependent on or associated with nonhuman nature. In essence, apart from those who live in and around forests, and NGOs and interest groups that have taken a conscious interest in forests and people, the other actors are in no way associated with the forests apart from the fact that it contains coal reserves. Their only short term gain from the forest is its resources. This is reflected in their actions as well.

Furthermore, they are much less vulnerable to change than those who live in and depend on forests. Thus, their concern for these systems also appears to be very meagre. On the other hand, those who live in and depend on forests are much more vulnerable to disturbance if their support system, the forest, is removed. Their weak economic status and lower access to information beyond the reaches of their spheres increases their vulnerability to both human manipulation and environmental disturbances. It is therefore inferable that *closeness of association with non-human nature, vulnerability both economically and physically, and degree of direct dependency on nonhuman nature* are proportional both to environmental risk perception as well as perception and valuing of nonhuman nature.

Perception and world view

Tribal communities are seen as impediments to progress, and as issues that merely need to be dealt with and put away. Apathy for those affected by the mining processes is an issue that is clearly seen in the way matters are handled (Kothari, 1996). In fact, displacement has actually been equated to development in many instances. Displacement has also been carried out with the aim of breaking up resistance to projects. The weak profile the tribal communities makes them both easy to manipulate and capitalize on (Kothari, 1996). Their numbers are misrepresented, their signatures are forged (Greenpeace India, 2014), and minimal compensation is given, if at all, along with generous amounts of indifference.

Further, in many cases, the word of planners and experts is considered unchallengeable. There is an inherent factor of arrogance and elitism involved, often, as they are supposed to be looking out for public and 'national' interests. Instead, the truly needy members of the public are easily ignored for the more affluent and influential ones.

6.2 Broad question:

How are social-ecological systems in Indian forests affected by coal mining activities? What are the patterns in the way interactions between actors and institutions affect these socio-ecological systems?

In summary, it is abundantly clear that the interplay of actors and institutions is very influential in determining the state of forests and their social-ecological systems. Section 4.1, has explained the various impacts of coal mining on tribal groups and forests, and through the three sub-questions discussed above, certain key points have been brought to light. There is a clear top-down tendency in governance, which increases the vulnerability of the social ecological systems, as they have limited scope to represent themselves. Also, there is a definite need for integrated policy making, and more importantly for greater accountability in policy implementation and safeguarding the vulnerable forest systems. Finally, the interests of different actors appears to be directly linked to their closeness of association with and dependency on non-human nature (the forests). It is consistently seen that reductionist worldviews, political interests and insufficiency of the institutional framework are common threads in the way interactions between actors and institutions affect social-ecological systems in Indian forests affected by coal mining.

Scope for Further Research

Several long-standing issues continually stand in the way of justice for both social and ecological systems affected by coal mining in India. These are problems with the way tribal communities and the value of ecosystems are apprehended, the way the policy structure in India is, and most importantly, the way the institutional framework fails to meet the needs of those who need it most. Each of the multifarious dimensions in which socio-economic-political-environmental factors interact to affect SESes, presents itself as an aspect to be researched on. These factors consistently tie back to worldview and the institutional framework.

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