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MASTER'S THESIS

**MANAGEMENT OF TIGERS' CONSERVATION IN INDIA: THE
CASE OF SIMILIPAL TIGER RESERVE**

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STATEMENT

I, Surjit Bhujabal, do hereby certify to be the author of this Master's thesis written under the mentorship of Professor Dr. Rudi Rozman in compliance with the Act of Author's and Related Rights-vide Para 1 of Article 21. I herewith agree this thesis to be published on the website pages of the Faculty of Economics, University of Ljubljana.

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INTRODUCTION

The tiger occupies a unique position in the human psyche (Schaller, 1998, p. 10). Being the apex predator of the forests its survival has been seen as survival of the forest ecosystem and all that goes with it (Karanth, 2001, p. 12). Distribution of tigers across its range spans a great diversity of bio-regions, including many biodiversity hot spots. Its conservation in nature is provenly a potent means of conserving a wide range of biodiversity. The tigers numbers in Asian forests in the 1960s touched an all time low – so few that the tiger was declared endangered and programmes were begun to protect them and their habitats. In India the tiger population fell to below 2000 by the second half of the 1960s (World Wide Fund for Nature, 1996a, p. 54).

Government of India launched specific tiger conservation initiatives in 1973 with the objective »to ensure maintenance of a viable population of tigers in India for scientific, economic, aesthetic, cultural and ecological values, and to preserve for all times, areas of biological importance as a national heritage for the benefit, education and enjoyment of the people«. Despite three decades of efforts at tiger conservation the tiger continues to remain one of the most endangered large predators in the world (Planning Commission of India, 2008, p. 43). The causative factors are many. Loss of habitat due to agriculture expansion and development, revenge killings by people due to man-animal conflicts, the demand for the body parts and derivatives of tiger in the illegal international market, etc. are some.

Today, there are no more than about 3,500 of these majestic big cats left in the wilds. Tigers in India are presently fighting a tough battle for survival. It is important to assess the threats being faced by tigers in their natural habitats and to reassess the requirements for management and to consider appropriate interventions if we are to ensure their long term survival. The protection of the tiger and the conservation of bio-diversity is a vital national, regional and global concern.

Considerable habitat for tiger continues to be appropriated by mega-development projects of hydropower, irrigation, mining and the like and the pressures on residual habitats get compounded by the humans displaced by such development interventions. If tigers get extinct, it will distort the whole ecological cycle of food chain.

The global community has realized the important role being played by forest and biodiversity rich areas in providing environmental services viz. local climate mitigation, buffers against extreme climatic changes, carbon sinks, as sources of supply of water, role played in national economies, generation of income for marginalized sections of the society, etc.

The distribution of tigers and their density vary in India due to several ecological and human reasons, viz. the forest cover, terrain, natural prey availability, presence of undisturbed habitat and the quality of managerial efforts undertaken towards protection (Forest Survey of India & Project Tiger India, 2008, p. 64). Tiger conservation results in the overall conservation of all other species of plants and animals occupying the ecosystem. A healthy tiger population indicates that the other ecological components in its habitat are equally robust, since tigers need adequate prey and good habitat. The investments made in ensuring the conservation of such habitats are more than justified.

Tiger habitats exist in environments of thousands of indigenous communities which depend on them (Daniel, 2001, p. 20). Therefore we cannot view these forests in isolation from the surrounding socio-economic realities and developmental priorities of the Govt. This calls for a cross-sectoral and cross-disciplinary approach.

The Similipal Tiger Reserve located in India was one of the areas earmarked for coverage under the Project Tiger Scheme of the Government of India. Situated in the state of Orissa, it was included under the Project Tiger Scheme in the year 1973. It is a biodiversity hot spot and harbours a healthy population of tigers. However it has its unique share of problems and threats. As per literature published in 2008 (Wildlife Institute of India & National Tiger Conservation Authority India, 2008, p. 40) there has been fall in the numbers of tigers in this reserve. This report estimated the presence of around 20 tigers in Similipal forests, a fall from about 100 tigers as reported in the 2002 tiger census.

The reports in this regard has raised public outcry keeping in view the unique status of this forest in the public domain both national as well as international. It is important that a proper assessment of threats being faced currently is made and suitable remedial interventions considered if the tigers are to return to Similipal in larger numbers. It is important that basing on the threats assessed the requirements of appropriate managerial inputs are reassessed/considered, keeping in view local and situational factors.

Conserving tigers in Similipal and in India will be of vital interest to the country's ecological security. It is important that we have in place an extremely robust management structure which is able to address all crucial issues impacting on the conservation of wild tigers in India.

The main purpose of this research is to provide suggestions for the management of tigers' conservation in India so as to ensure the survival of tigers in their natural habitats. They play an important role in the natural habitat, in the preservation of life. Their survival depends also on government goals and policies and strategies and on management of their natural habitats including tiger reserves and other protected areas. It is the purpose of this research, above all, to suggest for improvement management of tigers' conservation and for further improving their conditions which will increase their numbers in the reserve. This research is aimed at analyzing the management of the Similipal Tiger Reserve, but also focusses on management of other reserves and management of tigers at the national level. It is to mention that as a subject of Management, there have been few studies/research efforts on Similipal forests and tiger conservation. Based on the research undertaken there are suggestions for strengthening the system of management of wild tiger population in the country. Further it is expected that by adoption of a revised management approach the population of wild tigers in India could increase and reach its full potential.

This research has been carried out for the fulfilment of the requirement for Masters in Business Administration program in the University of Ljubljana (Faculty of Economics) and International Centre for Promotion of Enterprises, Slovenia. It is a part of the government of India's long term training program in Public Policy for senior officers. The purpose of this study is to arrive at findings which could make management of tigers' conservation in India more effective and result oriented. The findings from this research will be of interest to government agencies including the Ministry of Environment & Forests Government of India, Department of Forests Government of Orissa, National Tiger

Conservation Authority, management & administration of Similipal Tiger Reserve and Planning Commission India.

The main objective of the thesis is to suggest measures for improving management of wild tiger population in India with the emphasis on Similipal Tiger Reserve. This study has enabled to identify the strengths and weaknesses in the Similipal Tiger Reserve, to analyze the range of threats, to identify high priority areas for management support, and to identify strategic and system level policy interventions. Management envisages any organization, no matter whether new or old, whether small or big, is to run smoothly and achieve the goals and objectives which it has set forth (Robbins, Coulter & Vohra, 2009, p. 15–17). The thesis has examined the Similipal Tiger Reserve. The process of management in Similipal in particular and tiger reserves in general has been examined from the perspective of planning, organising, direction and control. These are the main management functions (Daft, 2009, p. 22–24). Threats and problems in the present context have been ascertained. The thesis aims to assess as how to address the threats being faced and whether there are management structures and institutional arrangements available/required in being able to do so. The thesis has developed suggestions for improving management structures for the Similipal Tiger Reserve and has examined as to how the experience from Similipal Tiger Reserve could be considered for better management of wild tigers in India. The issue of tigers' conservation in India has been analyzed from the perspective of public policy. The suggestions and recommendations emerging from research will be considered to be communicated to the implementing agencies viz., the Ministry of Environment & Forests Government of India, Department of Forests Government of Orissa, National Tiger Conservation Authority, and Planning Commission India.

It is envisaged to understand the background which required special emphasis to be laid for conservation of wild tigers in India and what are the current policy guidelines in place. Further keeping in view the existing policy framework, it is needed to understand whether they were adequate to achieve results, i.e. the conservation of wild tigers in India in their natural habitat.

Then as part of studying the impact of efforts being made it is being considered to take up Similipal Tiger Reserve as a case study. The significance of Similipal Tiger Reserve from biological (globally threatened species, ecosystems unique to the country, nationally threatened populations and Species rich ecosystems) and cultural perspective, including the environmental services have been examined. It aims to ascertain/understand values for which Similipal forests were considered for tiger conservation and understand issues which have adversely impacted upon the tiger numbers in Similipal. It is important to understand the threats and problems Similipal forests face in the context of survival of the tiger today. In respect of the future conservation of wild tigers in Similipal it is important to assess the problems and threats being faced in Similipal Tiger Reserve presently. Further this paper analyzes whether the policy guidelines and management structures in place are appropriate to achieve results and what improvements are required to be considered to address the threats and ensure better management in tiger conservation. While examining these various suggestions for improving governance/management structures for wild tiger management for Similipal Tiger Reserve in India have been considered and also suggestions in respect of conservation of wild tigers in India in general have been attempted.

Literature survey has been undertaken **for understanding management practices** of wildlife and wildlife reserves. Existing policy guidelines of the Government of India have

been examined where it has been ascertained as to what objectives and parameters of functioning have been laid down and with what procedural content. Accessing **secondary data sources** has been endeavored, including reports available with the Government of India, Project Tiger, Ministry of Environment & Forests, Planning Commission, National Tiger Conservation Authority, from non-governmental establishments and autonomous institutions like World Wide Fund for Nature-India, Wildlife Institute of India, Bombay Natural History Society, and provincial/state governments in India.

During the period of research **survey by questionnaires** duly communicated in person, internet, posts, and telephone has been undertaken to ascertain as to what are the present day threats in the case of Similipal Tiger Reserve. Ascertaining possible good practices has been done through literature survey, interactions with past tiger areas managers etc. Personal interviews of managers, officials, policy makers, conservationists, field researchers, forest staff and officials, etc. have been undertaken. Officials with whom personal interviews were conducted included District Forest Officers, Range Officers, Conservator of Forests, Chief Conservator of Forests, Field Directors of tiger reserves, Secretaries in state governments, Joint Secretaries & Directors in the federal government, Advisors in Planning Commission, etc. Wide ranging discussions with members from civil society groups including wildlife conservation organizations, research organizations in wildlife and forests, etc. were held during research. These interactions and discussions were held during the second half of 2010 in India focused on problems in management in tigers' conservation, possible ameliorative measures, ground situation, best experiences, etc. I visited the Similipal Tiger Reserve which is the case study for this master thesis, located about 1800 kms from New Delhi, during the course of research.

Based on this assessment it has been attempted to analyze as whether there are managerial structures in position to address them. Analysis of strengths, weaknesses, opportunities and threats or SWOT is an important tool in management (Certo & Certo, 2009, pp. 210–211). A SWOT analysis on Similipal regarding the threats and problems has been attempted.

The management of tigers' conservation in India has been analyzed from the perspective of public policy. Based on the findings from Similipal forests and analysis of public policy on tigers' conservation in India, suggestions for wild tiger conservation in India has been considered.

Chapters' structure of the MBA thesis follows the objectives and method. We start by determining management and above all the managerial process, which represents the basis for the analysis of management of Similipal tiger reserve. In the next chapter the overall scenario of tigers' conservation efforts and their results are discussed. In the third chapter management of Similipal tiger reserve is analysed whereas in the fourth chapter the governmental efforts are shown and analysed. In the sixth chapter most important issues regarding tigers' conservation are determined and discussed followed by the chapter on author's suggestions for tigers' conservation.

1 MANAGEMENT

1.1 Definition of Management

Management can be defined as coordination of all relationships (structures) and processes to which structures develop (Rozman, 2008, p. 6). Management can also be defined as execution of policy set by governance. Coordination can be defined (Lipovec, 1987, p. 14) as connecting and adapting relationships and organisational structures to the goal (of the social unit), to the environment and amongst themselves. It has also be stated to be integrating all processes in the social unit according to the goal considering size and timing. Management is a function of all dynamic relationships and executing the policy of owners (socio economic determination) in ensuring rational achievement of unit's goal by planning business, planning organisation, actuating organisation, controlling organisation, and controlling business (Rozman, 2008, p. 9).

Management can be defined (based on Lipovec definition, 1987) from different viewpoints as (Rozman & Sitar, 2007, p. 11):

- **coordination of technically divided labour** (or even better: coodination of all structures and processes) coordination being the content of managerial job (technical definition)
- **execution of interests and policies** established by governance (socio-economic definition)
- **as the process of planning, organising, ledership and control** (process defintion).

Governance, which is tightly connected to management function and forming a united governance-management process is an organizational function, which:

- is determined by socio-economic system;
- it is the ultimate power and source of authority;
- assures the interest of the owners, and
- determines major goals, strategies and policy.

1.2 Process of Management

The entire managerial process ensures the rational conduct and behaviour of employees (Rozman, 2008, p. 9). Without management there is a prospect of chaos or at least, a sub-optimal use of resources involving unnecessary wastage of human and/or material resources. Most authors define management as the process. Management is defined as process of planning, organizing, actuating (leading) and control (Schermerhorn, 1999, pp. 19–21). As per Daft management has been defined as the attainment of organizational goals in an effective and efficient manner through planning, organizing, leading and controlling organizational resources (Rozman, 2008, p. 7). Not much different but more systematic division of managerial functions is suggested by Rozman. According to him governing-management process consists of planning business, planning organization, actuating organization, controlling organization and controlling business; or planning (business), organizing (planning, actuating and controlling organization) and controlling (business and organization) (Rozman, 2006, p. 8).

1.2.1 Planning

Planning means looking ahead and chalking out future courses of action to be followed. It is a preparatory step. It is a systematic activity which determines when, how and who is going to perform a specific job. Planning is a detailed programme regarding future courses of action. It is rightly said »well plan is half done«. Therefore planning takes into consideration available and prospective human and physical resources of the organization so as to get effective co-ordination, contribution and perfect adjustment. It is the basic management function which includes formulation of one or more detailed plans to achieve optimum balance of needs or demands with the available resources. Planning is a process of thinking ahead upon given subject to assure (enable) the achievement of the subject's goal. Following the nature of governance, the governing decisions relate to planning and controlling the over-all business. Planning and controlling can be long run and short run. Long run decisions result in effectiveness and are more important. Short term decisions are more on efficiency oriented and less important and require immediate control (Rozman, 2003, p. 6). Business planning is thinking ahead upon the business to assure the achievement of the profit. There are short run plans like annual, tactical, budgeting and long run plans like strategic planning.

Basic kinds of overall business planning are short run (annual, tactical, budgeting) and long run (strategic) planning. Planning in small and medium (bus. functions org.) differs from the planning process in big enterprises (divisional structure). Process within small and medium companies is the following: internal or business and organizational analysis; external or environmental analysis and forecasting (SWOT analysis is the result of both); setting vision and goals; developing ways to achieve goals: setting strategies or tactics, and preparing planning tables.

Let us show the planning process in more detail.

Internal or Business Analysis is a process of (re)cognizing the business of a concrete enterprise with the purpose of improving decisions and of increasing profitability. Main elements of the analysis are: subject of analysis (enterprise, its business, parts of the business, organization, environment), purpose (economic, organizational, user) and method (including goal).

Analysis as method consists of observation (symptoms) and diagnosis (causes: weaknesses, strengths). Business analysis includes business (business functions) and its goal (profitability).

Analysis can be conducted in different ways

- Functional and profitability analysis (as described); including benchmarking.
- Value chain analysis.
- Value (costs-function) analysis.
- Operation research analysis (sensitivity analysis).
- Questionnaires, interviews: Delphi and similar analyses (strengths, weaknesses).

External Analysis is focused on the present and future environment. Environment is everything influencing enterprise and everything enterprise can influence. Most important

parts of the environment are customers, competitors, suppliers, government etc. The process of analysis is the same as already mentioned. However, also the forecasts are included. The result are the opportunities offered by environment to the enterprise as well as the outside threats endangering the enterprise. Often the environmental analysis is conducted as PEST (political, economic, social, technological or broader environment) analysis or attractiveness of the industry analysis, proposed by Porter: analysis of competitors (rivals), customers, suppliers, state. The environment with many opportunities and little threats is attractive.

SWOT analysis stands for strengths, weaknesses, opportunities and threats. Strengths and weaknesses (e.g. location, qualified labor force, good management, resources, etc.) result from inside of the enterprise and are found through internal analysis. Opportunities and threats (growth of the market, weak competition, etc.) are deriving from the environment and are the result of external analysis. SWOT matrix is the basis for preparing decisions on goals and strategies: SO, ST, WO, WT strategies.

Setting vision, mission and goals represents the next phase in the planning process. Vision is an attractive real-fantasy picture of the desired future. It gives direction to the enterprise as a frame for more detailed goals; it is also for motivation of people who identify with it. Vision can be a result of logic (SWOT analysis) and/or intuition. It is prepared by top management and supported by other managers and employees to be implemented. Mission or business mission is about reasons of enterprise existence. It tells about the benefits, which are aimed at different beneficiaries (stakeholders): customers, owners, employees, suppliers, municipality, ecology, etc. It includes: services to stakeholders, nature of business, strategic competitive advantages, behavior (ethics, cultural values), philosophy. Mission is not changed often. Broad goals are set within vision.

Strategies are long term decisions in choosing the right ways to achieve goals. Tactics are short-term decisions to do things right. Whether there needs to be one or more strategies depends upon the organisation. Strategies are above all investments, disinvestments, joint ventures, acquisitions, etc. They are often built on SCA (strategic competitive advantages).

1.2.2 Organizing

Organizing is the function of management which follows planning. It is a function in which the synchronization and combination of human, physical and financial resources takes place. All the three resources are important to get results. Therefore, organizational function helps in achievement of results which in fact is important for the functioning of a concern. A number of authors offer definitions of an organisation that bear similarities. According to Barney and Griffin (1992) organizations are collections of people working together in a coordinated and structured fashion to achieve one or more goals. This definition includes not only members and goals but also two other phenomena as well: structure, which is connected to technical division of labour and coordination. Thompson and McHugh (1995) define organization as consciously created arrangements to achieve goals by collective means. Pfeffer and Salancik (in Pfeffer, 1997) define organizations as collections of individual efforts that are coordinated to achieve things that could not be achieved through individual action alone.

Whereas the mentioned definitions define organization as a social unit other authors look at the organization as relationships assuring a rational conduct of business. According to Chester Barnard »organizing is a function by which the concern is able to define the role positions, the jobs related and the co-ordination between authority and responsibility«. Hence, a manager always has to organize in order to get results. Planning organization or organizing is a process of proposing the organization, which will lead to the best achievement of the enterprise goals (Mullins, 2008, pp. 111–144). So social units (organisations) consist of their members and members are connected by many ties: relationships. Relationships are connected to roles, which members of the social units play. Each member of the social unit sees his/her relationships and his/her role from the angle of his/her own role (Rozman, 2006, p. 12). Organisation in its developed form can be defined as the system of relationships between members of a social unit, which assures the existence, development and characteristics of the social unit and the rational achievement of its goal (Lipovec, 1987, p. 35). The static part of the organization is a relationship or a structure (relationships between members). The dynamic part are rationality assuring organizational processes.

Uniform organizational structures are technical, communicational, motivational and authority. They always develop to processes and they adapt to each other. All together represent a managerial structure.

Products and services within enterprise are produced by many employees. Everyone is taking part in one or a few operations (activities). **The entire activity of enterprise is divided to tasks, jobs, working posts.** The division of labor is planned (and coordinated) in advance. Labor is conscious change of natural elements to useful products and services. It is a process between men and nature. Individual working process consists of planning, controlling and execution. Technical division includes: splitting the over-all activity to tasks; combining tasks to jobs; assigning jobs to individual employees; assigning jobs of employees to departments; integrating departments into enterprise.

Communication process consists of preparing (coding), sending, receiving and interpreting (decoding) the information (understanding). Elements of the process are: sender, receiver, channel, and information (message, understanding). The relationship is between sender and receiver of information. Communication can be classic (verbal, written, body language) or electronic. Improving communication can be carried out by regulating information flow, repetition, simplifying language, encourage mutual trust, utilizing feedback, effective timing, effective listening, promoting ethical communication (not deceive, not harm, treat justly), encouraging mutual trust.

The unsatisfied need causes tension. It is followed by action to obtain means to satisfy need. Satisfaction of need is required for »survival« and well-being. Motive is the will, intention to act. **Motivation** is a process of establishing and widening motives, needs or goals. Motivated action is goal oriented (opposite is frustration). Motivation are psychological forces, which determine the direction of behavior, level of effort, level of persistence. All motives, goals together form interest. Needs, motives, goals depend on individuals, social environment, knowledge of individuals etc. Satisfaction of needs depends also on other individuals. Employees constrain (oppose, stimulate) each other in their needs' satisfaction, in their goal achievements. Motivation relationships are: goal-goal, need-need, reward-reward, need-reward, effort-reward, etc. By motivation the actions can be influenced in the desired way. Motivation is the means of coordination.

Power represents a capability to get someone to do something. It is a relationship between two members. Influence is the exercise of this capability. It is the potential to influence; it is power in action. Power causes the dependency. It is about obtaining, maintaining and using (also losing) power. Views on power: negative (neurotics – compensate) and positive (achieve goals); using force or voluntary. People follow because of: compliance (expect reward, punishment), identification (with the superior), internalization (values, moral). Power can be alienative (coercive), calculative (utilitarian), moral (normative). Bases of power: legitimate, (ownership, law), reward power, coercive power (power to punish), expert power, referent power (charisma). **Legitimate power is authority.** It is bound to position. It includes decision-making, information, access to resources power.

As mentioned already uniform structures join to the **managerial structure of duties, responsibility, authority and communication.** They show the position of each employee within the enterprise.

The static structure cannot assure the achievement of social unit's goal. The assurance of rational achievement of the social unit's goal is a lasting, dynamic process. Therefore each structure has to develop to the process. Within the organisation there exist four uniform structures, which all develop into processes. Technical structure (due to technical division) develops into technical process, communication structure to communication process, motivation structure to the motivation process and power structure to the power process (Rozman, 2006, p. 5).

1.2.3 Actuating

Business functions are executed by specialists, nonmanagers. The planned organisation has to establish duties, responsibilities, authority and communication, which integrate into managerial structures. Managers have to hire employees (or more specifically their roles or human resources), and lead them. Through the staffing or human resources management (hereinafter: HRM) function the planned organisation is transformed to the actual organisation. HRM is the process by which organizations satisfy their human resources needs by recruiting and selecting employees. The actual relationships differ from the plan. In reality not the members but their roles or even better their abilities are hired and later on developed. Employees are influenced by managers to execute the required tasks in an appropriate way by communication and by motivation. This together is the act of leadership. Leadership triggers the execution of the business. The process of **human resource management and leadership can be called the actuation process.** It establishes the actual organisation and triggers execution (Rozman, 2006, p. 7).

The first phase of the HRM process involves three tasks: human resource planning, recruitment and decruitment and selection.

1. **Human resource planning.** HR/manpower planning is the process of acquiring and utilizing human resources in the organization. It ensures that the organization has the right number of employees in the right place at the right time.
2. **Recruitment and decruitment.** After assessing both current and future needs of HR, the next step is HRM process i.e estimation of overstaff and under staff. If the vacancies exist, manager should recruit capable applicants and if HR Planning shows the surplus of employees the manager may want to reduce the organization.

Recruitment refers to the process of screening, and selecting qualified people for a job at an organization or firm. Decruitment refers to the process of reducing organization workforce, which is not pleasant and never easy to reduce an organization's workforce.

3. **Selection.** Selection can be conceptualized in terms of either choosing the fit candidates, or rejecting the unfit candidates, or a combination of both. So, selection process assumes rightly that, there is more number of candidates than the number of candidates actually selected, where the candidates are made available through recruitment process. A decision is correct when the applicant was predicted to be successful and proved to be successful on the job, or when the applicant was predicted to be unsuccessful and was not hired. Problem arise when errors are made in rejecting candidates who would have performed successfully on the job (reject errors) or accepting those who ultimately perform poorly (accept error). The cost of reject errors are more then cost of screening the right candidate because they can expose the organization to discrimination charges. The cost of accept errors include the cost of training, profit lost and subsequent cost of further recruitment and screening.

Employees performance management. In effective organizations, managers and employees have been practicing good performance management naturally all their lives, executing each key component process well. Goals are set and work is planned routinely. Progress toward those goals is measured and employees get feedback. There are various performance management systems that establish performance standards that are used to evaluate employee performance.

In an effective organization, compensation and benefits are used well. This means recognizing employees, individually and as members of groups, for their performance and acknowledging their contributions to the agency's mission. A basic principle of effective management is that all behavior is controlled by its consequences. Those consequences can and should be both formal and informal and both positive and negative. Organization compensation includes much different type of rewards such as wages salaries, incentive payment and other services etc. Many organization use alternative approach to determine compensation like skilled based pay (A pay system that rewards employees for the job skills they demonstrate) and variable pay (A pay system in which an individual's compensation is contingent on performance).

On the basis of employees' performance management the rewarding of employees, their further education and training and their promotion or demotion are determined.

An employee training is an important part of HRM activity. As job demands change, employee skills have to change. Types of training include:

- General Training consists of Communication skills, computer systems application and programming, customer services, executive development, management skills and development, personal growth, sales, supervisory skills and technology skills and knowledge.
- Specific Training consists of basic life/work skills, creativity, customer education, safty, ethics, sexual harassment, team building etc.
- Industry Specific Training.
- Customer Service Training.

The next HRM activity is managing employee performance and developing appropriate compensation and benefit programme.

Leadership starts and influences the actions of specialists. Leadership is the influence by one member (leader) of the group over other members to make the group or individuals achieve required goals. **Leadership includes communication, motivation and leader's traits.** Power of a leader rests above all on referent power. Manager-leader and leader-follower relationship are important.

Delegation is very important. Managers are responsible that their subordinates are fully occupied with rational tasks, act responsible and do not abuse authority. Barriers to delegation include fear that the subordinate will not do the job properly, where authority is not clearly defined, when responsibility is left at the superior or when lower levels do not like to take responsibility. Improving delegation can be done by establishing objectives, define authority and responsibility, involving subordinates, require completed work, provide training and establish adequate controls.

1.2.4 Business control

Managerial control problems occur in most of the organizations, whether large and complex or small and simple. It has been found that exercising effective control is a universal and exceedingly important managerial challenge. The most critical part for managers is to be able to differentiate between too many controls and too little. The disadvantages of exercising excessive control sets up situation where decision making gets affected as prior permission from higher ups is required leading to resentment and squelched motivations. However, too little control exposes organizations to risks, ranging from sloppy operations and failure to use resources efficiently and effectively, to spiraling of problems which get out of hand. For an organization control means regulation of activities and behaviours, and means to adjust or bring about conformity to specifications or objectives that have been set. Accordingly exercising control by managers is bound to impose restrictions.

The essence of organizational functioning requires that individuals give up total independence so that common goals and objectives may be accomplished. The coordination and order created out of the diverse interests and potentially diffuse behaviours of members is largely a function of control, and that control is a means to an end and not an end in itself. The managerial function of control is at the end of the other managerial functions viz. planning, organizing and leading and depends heavily upon them. Accordingly, carrying out proper planning, organizing and leading helps in establishing effective control systems. Simultaneously, result of control informs and improves the planning process in an organization, as it functions as a feedback for managers and enables them to adapt to changing circumstances and conditions. Good control systems let managers know if existing ways of operating are meeting the organization's objectives (Hitt, Stewart & Porter, 2009, pp. 395–400).

The basic elements of the **control process** in an organizational setting are:

1. Establish standards.
2. Measure performance.

3. Compare performance against standards.
4. Evaluate results (of the comparison) and, if necessary, take action.

Laying down **standards** or specifications is critical for a control process. This needs to start at the top of the organization and needs to involve every employee. It is important that articulation of a vision and formulation of broad strategic goals for an organization is done at the highest levels. Without a strategic vision and goals for the overall organization, managers will find it difficult to develop meaningful and agreed-upon performance yardsticks. Establishment of standards requires specificity, as measuring performance cannot be accomplished if the standards are vague. For example »efficiently responds to customer complaints« is not a usable standard while »responds, on an average, to three customer complaints per hour« permits objective measurement of performance.

Specific and concrete standards facilitates **measurement of performance** of people and equipment that the organization wants to monitor, and results in agreements on how performance needs to be measured. In the absence of readily quantifiable criteria it is important to obtain consensus on assessment of performances. For example it is easy to measure performances of students by using true-false or multiple-choice tests in a class as scores received are seldom contested, rather than by using essay questions in tests. Here it is important that one needs to agree in advance about the qualities of good answers and how the essay questions will be graded, because it will lead to acceptance of the measurement process. Gaining up-front commitment to the performance measurement methods – called as key performance indicators (hereinafter: KPIs) – is critical and reduces later complaints in actual work situations.

Comparisons of performance against standards are affected by the kinds of measurements available. If important measurements have not already been built into the system, it is usually not possible to go back and reconstruct them for purposes of comparison. When several dimensions of performance have been measured, it can involve multiple comparisons. In such circumstances it is easy to interpret if all comparisons all point in the same direction. However in cases where different results are arrived at, then it is important for managers to know to how to interpret the patterns of comparisons and draw appropriate conclusions.

Evaluation of results and taking actions is the most important step in the entire control process. Managers need to decide as to whether a single comparison or a pattern of comparisons requires action to be taken. Managers need to evaluate on the importance and magnitude of the deviations. In organizations which are required to take a decision on a host of data generated after comparisons against predetermined benchmarks, managers must determine whether a slight change in the same direction for all of the indicators is more or less important than a major change in just one indicator. In cases pertaining to national economies this type of judgment is not easy.

Managers need knowledge about the causes of the deviation as well as about the potential actions that are possible, if they are to decide what action is to take if the pattern and size of deviations from expected performance are determined to be significant. This step required managers to have strong diagnostic skills as well as certain degree of expertise, as some times causes of the problem may be easily recognized but decisions about which actions to take to correct them may be extremely difficult.

Managers need to take action if major negative differences between performance and standards are noticed because failure to do so can lead to more severe problems in the future. However positive deviations will not necessitate much action, though it may provide valuable insights about unexpected opportunities that should be pursued. To maintain positive performance, employees who are doing better than expected can be given increased recognition and rewards, and similarly when sales exceed their forecast production should be increased or product line extended. Similarly costs that are below target may suggest efficient practice that could be duplicated.

Another option available with managers is to use data on deviations (positive and negative), to assess whether the standards are correct and performance is the problem and conversely whether the performance is appropriate but the standards are too difficult. This enables managers to adjust standards. If standards have been set after great deal of effort and participation has been broad, then one needs to concentrate on performance achieved. However, if standards have been hastily set and without appropriate input from the relevant parties, then relooking at performance achieved may not be warranted.

1.2.5 Auditing or organizational control

Until now we either discussed control function in a general way (process, which is valid also in the auditing case) or connected to business control. However, there exists also a specific control of organization or audit control. **Audit control of organization or auditing controls whether duties, responsibility, authority as well as organizational processes are implemented and conducted according to the plan.** It is a control of considering rules, ethics, discipline, etc. Behavioral control includes performance evaluation of employees and managers. There are financial, operations, and management audits, external and internal auditing. Auditing looks for regularity (assurance of order, discipline, honesty, etc.), whereas business control looks for business success.

2 OVERALL SCENARIO OF TIGERS CONSERVATION UNTIL 2010

2.1Tiger

The tiger is one of oldest known felids believed to have evolved over 1 million years ago in Asia. From there the tiger spread north to the Amur region of eastern Russia, south to the islands of Indonesia, and southwest to Indochina and the Indian subcontinent, eastern Turkey, and the Caspian Sea. The tiger has distinct traits & at times is grouped as a separate sub genus (Johnsingh, Madhusudan & Pandav, 2010, p. 15).

The tiger (*Panthera tigris*) originated in the landscape that is now China, and was widely distributed over Southeast Asia even about two million years ago (Kitchener & Dugmore, 2000, p. 5). It began occupying, among others, a variety of biomes in the Indian subcontinent, including the high mountains of the Himalaya where temperatures dip several degrees below freezing.

The tiger (*panthera tigris*) is one of the biggest and most fearsome predators in the world. The body bears black stripes against a brownish yellow to rufous background with a white underside. The adult animal is solitary and strongly territorial when inhabiting better

habitats having fair prey density. The territory of the male in such cases encompasses smaller territories of two or more females. The distinctive colour scheme of the tiger allows it to camouflage unseen in the forest (Daniel, 2001, p. 10). Tiger is a solitary animal unlike lions. The size of a tiger's territory depends on the amount of food available, antipredator strategy of prey, distribution of welfare factors and usually range from about 10 to 30 square miles (26–200 sq km). Its iconic status has grown over the years and continues to hold people in awe and amazement (Johnsingh et al., 2010, p. 6).

As top predators, they keep populations of prey species in check, which in turn maintains the balance between herbivores and the vegetation upon which they feed. In short, when tigers thrive, the whole ecosystem thrives. The tiger is a universal flagship and an ambassador for other species living with it (Worldwide Fund for Nature, 1999, p. 20).

In the past century, the world has lost three of the eight tiger subspecies. The Bali, Caspian and Javan tigers have all become extinct, and the South China tiger is facing the same fate. The historical range has shrunk dramatically over the years and today the remaining tigers, numbering perhaps no more than 3,500, occur patchily across the Indian subcontinent, Southeast Asia, and the Russian Far East, with a small number still surviving in China and possibly North Korea (Worldwide Fund for Nature, 1999, p. 25).

In the 1990s, hundreds of tigers were killed to meet the demand for their bones and other parts, which are used for traditional medicines especially in China, Taiwan, and South Korea, but also in Japan and Southeast Asia. Tiger parts are also exported illegally to ethnic Asian communities all over the world, including those in Australasia, Europe, the USA, and Canada (Worldwide Fund for Nature, 1999, p. 12). In Nepal, earnings aid local communities. Were it not for the tiger, many protected areas would not exist today (Worldwide Fund for Nature, 1999, p. 40).

2.2 Tiger scenario during independent India

Although no historical data exist on tiger population sizes, old hunting records provide valuable insights into their abundance in the past. The historian Mahesh Rangarajan, for example, estimated that between 1875 and 1925, nearly 80,000 tigers were killed in Central India alone (Rangarajan, 2001, p. 9). An estimate placed the population of tigers in India at the turn of the century at 100,000.

Until the 1930s, sport hunting was the main cause of decline in tiger populations. Although trophy hunting persisted as a major threat to tigers up to the early 1970s, the greatest threat between the 1940s and the late 1980s was loss of habitat due to encroachment by a burgeoning human population, logging, and conversion of forests to commercial plantations such as oil palm and pulpwood (Worldwide Fund for Nature, 1999, p. 12).

At the IUCN General Assembly in Delhi, in 1969, anxiety was voiced about the threat to several rare species and wilderness areas in India. Things began to move thereafter because of an intensifying concern, spearheaded by the Indian Board for Wildlife. The IUCN offered to draft plans for scientific management and research if India were to support them and create special reserves. The WWF offered equipment worth \$10,00,000 (US dollars one million) so that the reserves could meet the highest standards.

The present distribution of tigers in India may be seen at Appendix 1.

2.3 Situation in early seventies

The first-ever All India tiger census in 1972, revealed that only 1,827 survived. Even if the earlier figure was an exaggeration, the 1972 figure projected a dismal picture. There was more than hunting behind the tiger's sinking fortune. Mounting demographic pressure gathering momentum towards the latter part of the last century, led to progressive diversion of wilderness to agriculture (Ministry of Environment and Forests, 2005, p. 8). A perverse lust for shikar among the privileged hunters took a heavy toll on wild animals. The totalitarian controls of the colonial-feudal era, nonetheless, prevented the masses from such indulgence. Post-Independence, even these controls crumbled. Private forests and village pastures were rapidly reclaimed for agriculture, directing rural pressure of small timber, firewood and grazing to hitherto sparingly utilized reserved forests. Hunting pressures both from villages and cities, legal and illegal, went up, depleting the prey base of the tiger. As prey became scarce, the carnivores turned to killing cattle. In retaliation, the villagers poisoned the carnivores. Such shrinkage and depletion of the wilderness coupled with direct elimination pressures caused all wild animal populations, including the tiger, to dwindle (Ministry of Environment and Forests, 2005, p. 6).

The year 1970 will be regarded as the cut-off year in the history of conservation in India. Wildlife had reached its lowest ebb by then, and the full implications of this devastation began to be felt. In 1970, a national ban on tiger hunting was clamped and in 1972 the Wildlife (Protection) Act came into force. In 1972 Guy Mountfort, an influential trustee of the Worldwide Fund for Nature (hereinafter: WWF), met (then) prime minister Indira Gandhi, urging her to save the species from extinction. Well known for an abiding concern on environmental and conservation matters, the prime minister set up a group of specialists to study the situation and create a plan for the future.

The blueprint for **India's tiger conservation programme** emerged: **Project Tiger**, as it came to be known. A Tiger Task Force was appointed under the chairmanship of Dr Karan Singh, then minister for tourism and civil aviation. In its report, the first Tiger Task Force (Indian Board for Wildlife, 1972, p. 10) observed: »To maintain a genetically viable population of tigers, a considerably large number of tigers would be required than the reserves and their contiguous forests can presently carry... it is necessary to increase the tiger population to optimum levels by the improvement of the biotope and stimulation of its diversity, according to sound principles of conservation. This situation will, in addition, provide a breeding nucleus from which surplus animals can migrate to surrounding forests.«

This focus on the flagship species was, in effect, meant to cover the entire ecological pyramid the tiger represented. From the cold Himalayan high altitude forests to the steaming coastal mangroves of the Sunderbans, from the scorched arid scrublands of Rajasthan to the lush evergreens of the south and the north-east, and from the flat terai swamps to the rolling hard grounds of the peninsula, the tiger is very much at home. The well-being of the tiger was, and still is, synonymous with the health of the Indian wilderness.

2.4 Launch of systematic tiger conservation

Project Tiger was launched in 1973, and this concern and the direction were reflected in the message for the occasion from Prime Minister Indira Gandhi who regarded it as a truly national endeavour: »The tiger cannot be preserved in isolation. It is at the apex of a large and complex biotope. Its habitat, threatened by human intrusion, commercial forestry and cattle grazing, must first be made inviolate«. A six-year plan involving an outlay of no less than \$5,900,000 was approved by the government. Field work for soil and water conservation and for habitat restoration commenced simultaneously. The effort was initially supported with vehicles, boats, wireless sets and other equipment received through WWF assistance. Subsequently, it became a fully national endeavour with no external financial support. Technically, it remained a religiously guarded Indian venture at all states – conception, formulation and implementation. The objective »to ensure maintenance of a viable population of Tigers in India for scientific, economic, aesthetic, cultural and ecological values, and to preserve for all times, areas of biological importance as a national heritage for the benefit, education and enjoyment of the people« (Project Tiger Directorate, 2004, p. 5). The Project Tiger scheme has been under implementation since 1973 as a Centrally sponsored scheme of Government of India for conservation of wild tigers in India. Main objectives under the scheme include wildlife management, protection measures and site specific ecodevelopment to reduce the dependency of local communities on tiger reserve resources.

2.5 Features of Project Tiger

‘Project Tiger’ implementation by States is governed by the Government of India guidelines (Project Tiger Directorate, 2004, p. 1) and the Indian Board for Wildlife Task Force Report on Project Tiger (Indian Board for Wildlife, 1972, p. 4). The Task Force had suggested adherence to the holistic environmental approach for field management of Tiger Reserves. Para 7.7.1 of the report explicitly states that in Wildlife Reserves, wildlife interest must take priority over timber production. The Steering Committee of Project Tiger (1976) has emphasized that forestry operations in the buffer zone should be organized and reoriented to keep the interests of wildlife as the primary objective. The general strategy of the project, therefore, involve setting up of several Tiger Reserves each including a »core area« free of all human use, and a »buffer« having conservation oriented land use.

The foreign advisors from the World Conservation Union suggested to the task force that **»the best method of protection of the tiger is to have large areas of at least 2,000 square kilometres** (hereinafter: sq km), with similar contiguous areas so that a viable population of about 300 tigers in each such area can be maintained«. Interestingly, the advisors also said that the »idea of continuous blocks of 2,000 sq km is to rotate such units by opening one of the units for periodic controlled shooting«. The task force, however, demonstrated political realism in creating reserves with an average size of 1,500 sq km, and embedding them within already protected reserve forests; with the objective that these forests would provide enough space for tigers to roam.

The management plan was that each reserve would have a **‘core’** for tigers to breed and live undisturbed in, **and a ‘buffer zone’** where limited human activity would be allowed. In the ‘core’ – a *sanctum sanctorum* of at least 300 sq km – no felling, grazing or

movement of humans, except for matters related to reserve management, would be permitted. Said the task force in this respect: »...forms of human disturbance, such as commercial felling, collection of minor forest produce, mining, excessive traffic, heavy grazing by domestic livestock are clearly detrimental and must be phased out for complete elimination.« Also, the task force was conscious that maintaining a genetically viable population of tigers would require larger areas than the reserves and their contiguous forests provided. The members strongly ruled against any operation to hold tiger populations at artificially high levels by using methods like habitat modification or artificial breeding. They believed, instead, that the reserves would provide a breeding nucleus from which surplus animals could disperse into surrounding habitats.

It was recognized that **tiger population breeds** well and grows rapidly **in habitats without incompatible human uses**. They cannot co-exist with people particularly in a situation where both human impacts and live stock grazing is continuously on the increase. The long-term survival of the tiger therefore depends on how secure and inviolate are the protected areas they live in.

2.6 Project Tiger since 1973

2.6.1 Phase one: 1972–1980

Initially, Project Tiger was conceived for six years from April 1973 to March 1979. Initially, the Project started with **9 tiger reserves**, covering an area of 16,339 sq km, with a population of 268 tigers. The selection of reserves was guided by the need to conserve unique ecosystem/habitat types across the geographic distribution of tigers in the country. These were:

1. **Manas**, Assam: eastern Himalayan foothills, with semi-evergreen to evergreen forests and heavy rainfall;
2. **Palamau**, Bihar (now in Jharkhand): eastern peninsular region, with *sal* and bamboo forests;
3. **Similipal**, Orissa: Mahanadi basin, with moist miscellaneous forests;
4. **Corbett**, Uttar Pradesh (now in Uttarakhand): central foothills of the Himalaya, with *sal* as the predominant species;
5. **Ranthambhore**, Rajasthan: Junction of Aravalli and Vindhya, with dry deciduous open forests;
6. **Kanha**, Madhya Pradesh: central peninsular India, with *sal* and miscellaneous forests;
7. **Melghat**, Maharashtra: southern offshoot of Satpura, with deciduous forests dominated by teak and bamboo; and
8. **Bandipur**, Karnataka: miscellaneous forests of the Western Ghats.

The mangrove forest of Sundarban was added when the project was formally launched and these became the first nine tiger reserves in the country.

2.6.2 Phase two: 1980–1990

By early 1980s, there were 15 tiger reserves in the country, in an area of 24,712 sq km. Periyar in Kerala and Sariska in Rajasthan were added in 1978, and in 1982, four more –

Buxa in West Bengal, Indravati in the then Madhya Pradesh, Namdapha in Arunachal Pradesh and Nagarjunasagar-Srisailem in Andhra Pradesh – became part of the Project Tiger fold. In the early 1980s, the then prime minister wrote to all state chief ministers emphasising on the need to follow the detailed guidelines issued by the cabinet secretariat (department of personnel) and the ministry of agriculture. In 1983, the Task Force on Public Support for Wildlife Conservation, was set up by the Indian Board for Wildlife (now the National Board for Wildlife) to recommend ways and means of eliciting public support for conservation (Indian Board for Wildlife, 1983, p. 8). The concern was clear: conservation efforts were increasing, but policy makers realised there was a »growing degree of apathy and indeed, antipathy, towards wildlife among different classes and sections of the public«, as the report put it in its introduction. This task force focussed on the issue of the dependence of rural people on forests, and what conservation-led policing did to this relationship. It said: »Most communities in the neighbourhood of reserves sustain themselves by eroding marginal land and depleting forest pastures. In their precarious existence, enforcement of restrictions in wildlife reserves triggers antagonism. That discipline is essential to revive essential life support systems that these areas provide is not appreciated for the same reason.«

2.6.3 Phase three: 1990–2000

The turning point in India's tiger conservation programme came in the 1990s. Problems erupted. This was also a period, like the early 1970s, when international nongovernmental organisations (hereinafter: NGOs) were active in pushing policy in the country. **By now India had 19 tiger reserves**, encompassing 29,716 sq km, with a population of 1,327 tigers (1989 tiger census). But as a critical review of Project Tiger, carried out in 1993 by the Union ministry of environment and forests (hereinafter: MoEF), acknowledged (Ministry of Environment and Forests, 1993, p. 10): »All in all, **Project Tiger faces a new set of problems**. Project Tiger saved the tiger from extinction in the nick of time but over 20 years it is clear that expanding human populations, a new way of life based on alien models and the resultant effect on natural resources has created fresh problems that indicate danger for the tiger. Militancy and poaching only add fuel to the fire. This is a serious and critical moment in the history of tiger conservation.«

In 1994, a Parliamentary Committee on Science, Technology, Environment and Forests recommended an evaluation of the programme to make it more meaningful and result-oriented. The committee felt this was necessary because the »objectives of Project Tiger have not been achieved in as much the tiger population in the country has registered a decline, poaching still continues in menacing proportions and the habitat of the tigers seems to have shrunk in area«. This is an instance of failure of enforcement of usufruct rights. Following this committee's recommendations, another high-powered committee headed by J. J. Dutta, former principal chief conservator of forests in Madhya Pradesh, was constituted. The Dutta committee submitted its report in early 1996. It examined issues of management as well as the interface with local people in reserves. Here was a report that, for the first time, discussed what needed to be done in terms of the legal status of what it called »enclaved villages« – human habitations within national parks. Interestingly, it argued that while the removal of villages from tiger reserves was an ideal circumstance, it was not a management imperative.

In fact, conservation demanded that efforts must go beyond this issue to identify link corridors and management of forests outside the reserves. It also scrutinised issues of personnel as well as administrative and other facilities. This was also the time when WWF-India released its action plan to save the tiger, (Worldwide Fund for Nature, 1996a) and (Worldwide Fund for Nature, 1996b). **The plan focussed on the need to involve local communities** as well as measures to improve the anti-poaching enforcement network.

2.6.4 Phase four: 2000–2010

By 2005, India had 90 national parks and 501 wildlife sanctuaries covering an area of 1,56,934 sq km (roughly 22 per cent of the forest area and 5 per cent of the land area of the country). Of these, 28 have been declared tiger reserves, spread over 37,761 sq km in 17 states. These reserves constitute roughly 5.6 per cent of the recorded forest area and over 1 per cent of the country's geographical area. The total tiger population recorded in the 2001–2002 'census' was 3,642, but over half of these tigers live outside tiger reserves.

It was during this phase that the worst episode in India's tiger conservation history took place. All tigers from the Sariska Tiger Reserve became extinct (Wildlife Institute of India, 2005). It was a major embarrassment for both the federal and state government. This led to setting a high level Task Force in 2005 to look into the causes and also suggest measures for conservation of tigers. Accordingly the Government of India constituted a high level task force to examine the issues of tiger conservation in the country and suggest measures for strengthening tiger conservation, for a new wildlife management paradigm that shares concerns of conservation with the public. Broadly **the urgent recommendations** of the said task force were as below:

- Reinvigorate the institutions of governance;
- Strengthen efforts geared towards protection of tiger, checking poaching, convicting wildlife criminals and breaking the international trade network;
- Expand the undisturbed areas for tiger by reducing human pressure;
- Repair the relationship with local people who share the tigers habitat by fielding strategies for coexistence;
- Regenerate the forest habitats in the fringes of the tigers protective enclaves by investing in forest, water and grassland economies of the people.

Project Tiger was converted into a statutory authority viz. National Tiger Conservation Authority (hereinafter: NTCA) by providing enabling provisions in the Wild Life (Protection) Act, 1972 through an amendment, viz. Wild Life (Protection) Amendment Act, 2006. This formed one of the urgent recommendations of the Tiger Task Force appointed by the Prime Minister (Ministry of Environment and Forests, 2005, p. 6).

The Project Tiger continues as an Centrally Sponsored Scheme in the XIth five-year Plan, 2007 to 2012, of the Government of India. Conservation of endangered species and their habitat, strengthening and enhancing the Protected Area Network, control of poaching, monitoring, research and ensuring people's participation in Wildlife Conservation have been accorded high priority in the National Wildlife Action Plan and the Wildlife Conservation strategy, 2002. During present plan period, 100% Central Assistance is being made available to States for expenditure on all non-recurring items; for recurring items, the Central Assistance is restricted to 50% of the expenditure, while the matching grant is

provided by the Project States (Project Tiger Directorate, 2004, p. 8). The tiger reserves in the country at present may be seen at Appendix 2.

2.7 Tiger population over the years

The distribution of tigers and their density vary in States due to several ecological and human reasons, viz. the forest cover, terrain, natural prey availability, presence of undisturbed habitat and the quality of managerial efforts undertaken towards protection (Forest Survey of India & Project Tiger India, 2008, p. 64). Tiger conservation results in the overall conservation of all other species of plants and animals occupying the ecosystem. A healthy tiger population indicates that the other ecological components in its habitat are equally robust, since tigers need large amount of prey and good habitat (Qureshi, Gopal, Shirish, Basu, Mitra & Jhala, 2006, p. 16). The statewide figures on tiger numbers for the years 1997 and 2001–2002 may be seen at Appendix 3.

As per literature published in 2008 (Wildlife Institute of India & National Tiger Conservation Authority India, 2008, p. 10) there has been fall in the numbers of tigers in the country as per an all India forest occupancy and population estimates of tiger (Jhala, Gopal & Quershi, 2008, p. 8). This report estimated the presence of around 20 tigers in Similipal forests, a fall from about 100 tigers being projected a few years before. The tiger numbers as per tiger landscapes may be seen at Appendix 4.

2.8 Similipal Tiger Reserve

Similipal is located in the district of Mayurbhanj in Orissa state. Similipal is in the eastern end of the eastern ghats and classified in the Chhotanagpur biotic province of the Mahanadian bio-geographical region (Similipal Biosphere, 2010). The Significant Features of Similipal include:

- Relatively higher annual precipitation of over 200 cm spread over about 135 days.
- Altitude ranging from 40 mts to 1168 mts (Khairiburu and Meghasini hills).
- Numerous water courses and two permanent water falls namely Barehipani(400 mts) and Joranda (150 mts).
- Occurrence of frost valleys in central and south Similipal. A degree of resemblance of floral and faunal composition with those of the Western Ghats and north-east India, while being a representative eco-system within the Mahanadian bio-geographic region.
- Marked variation of temperature range between the central and southern regions.

Similipal is a blend of Western Ghat, Eastern Ghat and Sub-Himalayan species with 1,076 flowering species and 96 species of orchids. The following five forest types are met with in the landscape:

- Northern Tropical Semi-evergreen forests,
- Northern Tropical Moist deciduous forests,
- Dry deciduous hill forests,
- High level Sal forests, and
- Grass lands.

Similipal Forests was brought under the fold of management through a Forest Policy pronounced by the then Maharaja of Mayurbhanj in the year 1885 (Similipal History, 2010). The wildlife in Similipal Forests was managed primarily for recreation of the Royal family and their guests. Elephant catching through 'Kheda' operation was a regular practice. 'Akhand Shikar' (tribal hunt) was celebrated continuously for five to seven days during the month of April every year. The forest was worked as per the Working Plan prepared by Mr. C. C. Hart in 1896–1897 till 1946, through lease and contract. The main purpose of timber harvesting was to earn revenue for the Royal exchequer. Since 1946, the forest was exploited systematically as per prescription of Working Plan till merger of the ex-state in the Union of India on 6th November 1948, which became part of Orissa a district on 1st January 1949.

Despite practicing commercial forestry, supplying railway sleepers and other utility timber outside Mayurbhanj, the ruler was very rigid in his forest protection measures and employed large number of forest staff, much higher in number in comparison to other princely states and even the directly British administered areas with good network of forest roads and communication facilities. The protection of forest suffered a set back after independence due to issue of liberal shooting permits. Although there was depletion of wildlife still the number of tigers inhabiting the area was potentially high (Similipal History, 2010). The era of protection of forestry started ushering in strict protection measures for the wildlife after declaration of Similipal Tiger Reserve during the year 1973 with Shri S. R. Choudhury as the first Field Director as per policy of Govt. of India under »Project Tiger«.

2.8.1 Organization of Similipal Tiger Reserve

The Similipal Tiger Reserve is a delineated area of forest notified as a Tiger Reserve in India. It is a pure government entity headed by a Field Director appointed by the regional (state) government. It has territorial jurisdiction and a hierarchical administrative structure with Field Director at top, Deputy Directors, Assistant Conservator of Forests, Range Forest Officers, Foresters, Forest Guard and casual labourers. It is governed by guidelines issued by federal government and managed by regional government with matching financing support.

Similipal RF is the biggest Reserve Forest block of India with an area of 2,271.78 km. The forest is a potential habitat both for wild animals and plants with good population of tigers, leopards, elephants, chital, sambar and 304 species of birds. It is equally important for amphibians, aquatic animals and invertebrates. Considering the importance of its rich biodiversity the area was declared as a proposed wildlife sanctuary on 3rd December 1979 by Govt. of Orissa. After settlement of all rights of the people of 61 villages it was finally declared as wildlife sanctuary during 1979 covering an area of 2,271.78 km² (Similipal Wildlife Sanctuary, 2010).

The Similipal Tiger Reserve (hereinafter: STR) is a compact block of elevated plateau located in central portion of the Mayurbhanj district and lies between 20° 17' and 22° 34' north and 85° 40' and 87° 10' east longitude. The stretch of forest including Similipal RF spreads over an area of 2,750 sq km was declared as 'Tiger Reserve' with effect from 4th December 1973 under 'Project Tiger' Scheme of Government of India. The notification has clearly indicated with boundary description of Critical Tiger Habitat (Core) extending

over 1,194.75 km² and buffer area of 1,555.25 km². There are 4 villages inside the Critical Tiger Habitat and 65 villages in the buffer area (Similipal Tiger Reserve, 2010).

Similipal National Park is located between 21° 35' and 22° 01' north latitude and 86° 13' and 86° 37' east longitude. It is situated within Mayurbhanj district of Orissa state. It is a proposed National Park notified in two phases, first on 6th August 1980 for an area of 303 km² and subsequently 542.70 km² of area was added to it on 11th June 1986 making the total area of the Park 845.70 km². The significance of the National Park is its rich biodiversity (Similipal National Park, 2010).

The Similipal Biosphere Reserve came into existence during 1994 as per Man And Biosphere (hereinafter: MAB) programme of UNESCO with the objective of bringing the people and domestic cattle along with the Forest & Wildlife into one fold of management so that the economic condition of the people is enriched through eco-development programmes so that the dependency on the forest is reduced. The total area under the Biosphere Reserve is 5,569 km² with Similipal Sanctuary at the nucleus (Similipal Biosphere Reserve, 2010).

The map of Similipal Tiger Reserve may be seen at Appendix 5.

2.8.2 Bio-diversity and tigers

Similipal is the abode of 94 species of orchids and about 3,000 species of other plants. These include 2 species of orchids which are endemic, 8 plants which are endangered, 8 species whose status is vulnerable and 34 other rare species of plant. Similipal is also the abode of the black and melanistic tiger which is rare. The identified species of fauna include 12 species of amphibians, 29 species of reptiles, 264 species of birds and 42 species of mammals, all of which collectively highlight the biodiversity richness of Similipal (Islam & Rahmani, 2003, p. 17).

The Similipal National Park is the most important protected area of Orissa, and one of the largest Tiger Reserves (2,75,000 ha) in India. At one time, it was the hunting ground of the Maharajas of Mayurbhanj, where record sized tigers were shot (Srivastava & Singh, 2002, p. 10). The major perennial streams are the Budhabalanga, Palpala, Deo, Nekendanacha, Bandan, Khairi and Khadkei (Islam & Rahmani, 2003, p. 2).

The vegetation of the Similipal National Park ranges from Semi- Evergreen to Dry Deciduous. The most important species are *Shorea robusta*, *Terminalia tomentosa*, *Syzygium cumini*, *Protium serratum* and *Dillenia pentagyna* (Mohanty, Mishra & Bal, 2002, p. 2). More than 90 species of orchids are found in this protected area, of which atleast two are endemic (*Eria meghasaniensis* and *Bulbophyllum panigrahi*).

Reports (Jain, 2001, p. 6) say that more than 250 species of birds are found here. Similipal forest stands as a link between the flora and fauna of southern India and the Himalayas. For instance, the Red-breasted Falconet *Microhierax caerulescens* was sighted in Similipal in 1987, far south of its known range in the Himalayan foothills, Sikkim, Bhutan and Assam (Ali & Ripley, 1987, p. 8). Birdlife International has identified that 59 species in Biome-11, of which 33 have been reported till now from Similipal (BirdLife International, 2001, p. 20). Similipal is a very interesting important bird area, not only from the view

point of protection of tropical dry forest avifauna, but also from the biogeographic point of view as it connects the Eastern Himalayan avifauna to that of the Western Ghats, albeit through a weak link (Islam & Rahmani, 2003, p. 10). The list of birds identified as critically endangered in Similipal may be seen at Appendix 6. Important mammals of the Park include Tiger *Panthera tigris*, Leopard *Panthera pardus*, Asian Elephant *Elephas maximus*, Sambar *Cervus unicolor*, Mouse Deer *Moschiola meminna*, Chital *Axis axis*, Gaur *Bos frontalis*, Wild Dog *Cuon alpinus*, Sloth Bear *Melursus ursinus* and Striped Hyena *Hyaena hyaena*. Among reptiles, Mugger *Crocodylus palustris* is the most prominent species. King Cobra *Ophiophagus hannah* is also found (Islam & Rahmani, 2003, p. 2).

3 MANAGEMENT OF SIMILIPAL TIGER RESERVE

Tiger Reserves across the country have sought to adopt standardized process in respect of planning, organizing, directing and control. Let us examine the various aspects of management of tiger reserves in the country. Attempt has been made in the succeeding paragraphs to examine past experiences and also inputs obtained by me during the course of interviews and responses to questionnaires.

The NTCA addresses the ecological as well as administrative concerns for conserving tigers, by providing a statutory basis for protection of tiger reserves, apart from providing strengthened institutional mechanisms for the protection of ecologically sensitive areas and endangered species. The Authority is required to ensure enforcement of guidelines for tiger conservation and monitoring compliance of the same, apart from placement of motivated and trained officers having good track record as Field Directors of tiger reserves. It is to facilitate capacity building of officers and staff posted in tiger reserves, apart from a time bound staff development plan (National Tiger Conservation Authority, 2008, p. 1).

3.1 Planning of Similipal Tiger Reserve

3.1.1 Internal Analysis

3.1.1.1 Manpower

Similipal Tiger Reserve consists of the Field Director, three territorial forest divisions and 12 Range Offices. Further in the core there are 39 Protection Camps while in the buffer there are 19 such camps. In the Table 1 the position on staff is shown.

Table 1: Staff in position and vacancies 2009

| | Total | In position | Vacant | % of vacancies against sanctioned posts |
|-------------|--------------|--------------------|---------------|--|
| Core only | 145 | 90 | 55 | 38 |
| Buffer only | 104 | 94 | 10 | 10 |
| Total | 249 | 184 | 65 | 25 |

Source: Pandav et al., Similipal tiger reserve – a rapid field assessment of conservation status, 2009.

The position of Forest Guards, Foresters and Forest Rangers in the core area is very unsatisfactory as there are respectively 40, 24 and 60% vacancies on these posts. No fresh

recruitment has taken place for a long time and hence the average age is high i.e. approx. above 50 years.

Due to age old ritual of mass hunting (Akhand Shikar) in the tiger reserve by tribal people, the tiger reserve management had to seek help from armed police reserve forces of the state government, and deploy large number of home guards and forest staff from the plains area to prevent this activity. Other than the field staff the TR has no special strike force.

The lowest in the hierarchy in wildlife protection is the **Forest Guard**. Guards in India undertake this task mostly on foot patrols, covering their assigned areas called 'beats'. On an average while a forest guard covers an area of 14.94 km², a forester covers an area of 53.29 km². Besides, the statistics indicate huge variation in the area covered by the forest guard and the forester in different tiger reserves. Huge vacancies ranging between 43 to 62 *per cent* existed in the cadre of forest guards and watchers in Sunderbans, Namdapha, Bandipur, Simlipal, Palamau and Indravati reserves while there was surplus staff at Bandhavgarh, and Bori-Satpura Tiger Reserves (Ministry of Environment and Forests, 2005, p. 34). During my discussions and interviews with officials and persons associated with tiger conservation in the country it was emphasised though that the onus rests with the government of India to fix the manpower norms of frontline staff in each Tiger Reserve with due consideration to the specific eco-systems/habitats in consultation with the concerned state governments.

The average age recommended by Wildlife Institute of India for frontline forest staff is 18-35 years. It was seen that the average age of the forest guards posted in the reserves was 43 years and that of foresters was 47 years. At Palamau, Ranthambore, Simlipal and Pench (Maharashtra) Tiger Reserves, the average age of a forest guard was in the range of 50 to 53 years. The forester's average age was above 50 years in Kanha, Palamau, Ranthambore, Simlipal, Sariska, Indravati, Dudhwa, Pench (Madhya Pradesh), Tadoba-Andhari, Satpura and Bandhavgarh Tiger Reserves. Deployment of aged forest guards and foresters would undermine conservation and protection efforts in the reserves (Comptroller and Auditor General of India, 2006).

It is suggested that:

1. Efforts should be made to improve communication and intelligence network, for creation of strike force, provision of adequate arms and ammunition. NWCCB should be set up early for overall support in combating wildlife crime.
2. Firelines and fire towers should be created and maintained adequately.
3. For effective patrolling of the reserves, number of camps/chowkis and forest guards and foresters in the camps should be augmented. The staff deployed should be physically fit, capable of carrying out patrolling duties and adequately trained.
4. Efforts should be made to augment the manpower capacity at Project Tiger directorate to equip it as an effective oversight agency.
5. Efforts should be made at augmenting the capacity of the Regional Wildlife offices for effective control of illegal trade in wildlife.
6. Vulnerable exit points should invariably be covered and efforts need to be made at improving the co-ordination among the various agencies involved in control of illegal wildlife trade.

In 2003 (Swain, 2009, p. 4), Similipal tiger reserve administration initiated an innovative method to entail the youth of fringe villages in the protection of the reserve. The enthusiastic youths of a village were formed the **Green brigade**, locally called Sabuja Vahinee, to guard against the felling of trees and killing of animals. For the formation of Green Brigade, a series of meetings were conducted in the village, explaining to the community the role of forest cover in soil and water conservation in the watershed of the river passing through their village. The importance of maintaining the biodiversity of Similipal was also discussed. The volunteers were provided with identity cards issued by the divisional forest officer. This has proved useful and it was reported that there were no incidences of mass hunting during 2003–2004 (Project Tiger, 2006, p. 42).

By 2006, 37 Green Brigade groups, consisting of 323 volunteers, were formed in and around Similipal. Even women participated as volunteers. The volunteers were successful in convincing people against the pernicious practice of mass hunting of animals (known as Akhand shikar) by indigenous people. As the volunteers were members of the same community, people listened to them, and felling of trees and hunting of animals reduced substantially. In recognition of such volunteer service, eco-development activities were adopted in their villages with funds available from Project Tiger. In 2006, the dense forest cover of ten out of eleven watersheds in Similipal sanctuary was improved, as compared to 2003. The dense forest cover in the watershed of Sanjo was decreased, however, as the fringe villages of the watershed responded poorly. No Akhand Shikar occurred in 2006 and 2007, as it was successfully prevented with the help of the volunteers. In 2005, 237 people were arrested at an incident inside the reserve because of timely intervention by the volunteers. Prior to this, arresting people engaged in community hunting was impossible even with a contingent of armed police. The key factor in the formation of such groups as the Green Brigade is regular activities in the form of eco-development. But such activities are limited due to paucity of funds (Swain, 2009, p. 5).

3.1.1.2 Financial resources

Funding assistance provided by the government of India for the protection and management of the Similipal Tiger Reserve may be seen below in the Table 2:

Table 2: Funds (Rs. in lakhs) allocated for Similipal Tiger Reserve by government

| No. | Name of Tiger Reserve | 2000–2001 | 2001–2002 | 2002–2003 | 2003–2004 | 2004–2005 | 2005–2006 | 2006–2007 | 2007–2008 | 2008–2009 | 2009–2010 |
|-----|-----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1. | Similipal, Orissa | 83.31 | 126.81 | 32.88 | 151.91 | 116.44 | 80.00 | 183.87 | 43.28 | 550.99 | 42.35 |

Source: Rajya Sabha, Reply to Question No. 1512 on 9th August 2010, Parliament of India, 2010a.

Comptroller and Auditor General of India (hereinafter: CAG) (Comptroller and Auditor General of India, 2006) analysed the fund allocation across tiger reserves against the area covered and the number of tigers. In both cases wide divergences were noticed. CAG has reported the **average funds** released per sq kilometre of tiger reserve area **had wide divergences in allocation**. During my discussions and interviews with officials and persons associated with tiger conservation in the country, it was evidenced that the funds

released for different tiger reserves could not be correlated to the areas of the tiger reserves or the tiger population.

As per the directive issued by the the government of India in May 2000, the state governments were to release central assistance to tiger reserves within six weeks from the date of its receipt. As per the CAG there were delays ranging from 1 to 8 months in the release of central assistance to the reserves in Assam, Rajasthan, Maharashtra, Karnataka, Tamil Nadu etc. (Comptroller and Auditor General of India, 2006). The Honorable Supreme Court of India in its direction in February 2005 had asked the state governments to release the central assistance within 15 days of its receipt. The government of India in March 2006 had cited **delay in the release of central assistance** by states as one of the difficulties faced in the implementation and monitoring of the project tiger scheme.

It is suggested that:

1. Allocation of financial resources to Tiger Reserves needs to be streamlined. PTD should establish formal criteria for allocation of funds and prioritize the Tiger Reserves based on their threat perception.
2. The issues relating to late release of central funds, diversion of funds and short release of counterpart funds by the States need to be addressed at appropriate levels to ensure that tiger conservation efforts become fruitful.
3. The expenditure authorized under the 'recurring' and 'non-recurring' heads should be explicitly defined and actual classification of funds should be checked.

Tiger conservation in the Similipal forests is being carried out by dual governance pattern, i.e., with the participation of the federal and regional government. Under the provisions of the Wildlife (Protection) Act, 1972, as amended in 2006, a tiger reserve consists of core or critical tiger habitat and buffer or peripheral area (Lok Sabha, 2010b).

A reserve specific Tiger Conservation Foundations are constituted under the enabling provisions contained in the Wildlife (Protection) Act, 1972, to facilitate and support the management of reserves for conservation of tiger and biodiversity, and to take initiatives in ecodevelopment, by involvement of people in such development process (Lok Sabha, 2010b). In the case of the Similipal Tiger Reserve no Tiger Conservation Foundation has been set up as of now.

3.1.1.3 Core and buffer zones

As per the National Tiger Conservation Authority, the management plans for each Reserve is prepared on the three cardinal principles:

- Elimination of all kinds of exploitation and disturbance from the core area, while rationalizing such activities in the buffer.
- Limiting the habitat management to repairing the damages inflicted on it by biotic pressure so as to resurrect the habitat in its natural form.
- Researching facts about habitats and wild fauna, while monitoring the changes in flora/fauna owing to Project Tiger initiatives.

The report of the Task Force of the Indian Board for Wildlife (Indian Board for Wildlife, 1983, p. 4) also emphasised that the security of wildlife reserves should be ensured by constituting »buffer belts« surrounding core units. While the core should be free from all human use, the buffer should allow restricted human use with a strong conservation bias.

This would require people to forego all use of forests in the core, while considerably curtailing such use in the buffer zone. In order to compensate for these restrictions, the productivity of the outer depleted area should be managed as a »multiple use surrounded« in terms of both agriculture and other related activities with viable alternatives. Therefore, such multiple use areas should be regarded as »special areas for eco-development«.

The buffer zone/multiple use area is a delineated area around a core zone of a Tiger Reserve/National Park/Sanctuary (Project Tiger Directorate, 2004), which facilitates:

- **Extension buffering** (Providing habitat supplement to the spill over population of wild animals from the core).
- **Social buffering** (Providing socio economic function to local people living in such areas so that their resource dependency on the protected area/core zone of tiger reserve is reduced).
- The habitat conserved in the buffer zone also serves as a **corridor** for wild animals.

The buffer zone of a tiger reserve has twin functions, viz.:

- To provide habitat supplement to the spill over population of wild animals from the core area, conserved with the active cooperation of stakeholder communities, and
- Providing site specific, need based, participatory eco-development inputs to local stakeholders for reducing their resource dependency on the core zone and for eliciting their support towards conservation initiatives in the area.

Therefore, both the buffer zone and the multiple use area, if any, surrounding the buffer, is required to be subjected to conservation oriented community programmes as a part of eco-development, taking care not to distort the village dynamics in an artificial manner resulting in the entry of market economy, which may make the whole exercise counter-productive.

3.1.1.4 Management guidelines of buffer zone/multiple use areas

The following guidelines were made for the management of buffer zone/multiple use areas around tiger reserves:

1. **The management plan of a tiger reserve** should have a **separate section/chapter for buffer zone** highlighting the strategy for ecodevelopment in the impact area. The numerous village level micro plans would form part of this section.

Communities living in the buffer zone/multiple use area of Tiger Reserves, Reserved Forest, Protected Area (having the status of Sanctuary, Conservation reserve, Community reserves or revenue land) should be involved in the management of Tiger Reserves with reciprocal commitment as a part of overall conservation strategy. The reciprocity would decide in the mutual *quid pro quo*.

Fostering site-specific eco-development initiatives based on participatory micro-level village plans to provide alternative resources to people apart from livelihoods. The eco-development inputs, interalia, may include biomass substitution (eg. alternative fuels), biomass generation and forestry, eco-tourism, agriculture, watershed management, small irrigation, local livestock improvement, agro processing, artisanry and any other site specific item as desired by the people, not having a deleterious effect on protected area resources.

Reciprocation by the local people through specific measurable actions as per a memorandum of understanding for improving protection and conservation, which interalia, may include curtailment of illicit grazing, reducing fuel wood and small timber collection from Protected Areas, increasing participation in fire protection and anti-poaching efforts.

Community involvement in the management of sanctuaries, Conservation Reserve and Community Reserve, in case they form part of the buffer zone of the Tiger Reserve, should be promoted as provided in sections 33B, 36B and 36D of the Wildlife (Protection) Act, 1972.

2. **No intensive form of land use** like mining, quarrying and the like should be fostered in the buffer zone, and due care should be exercised while granting no objection certificate to such activities in private/revenue areas, if any, included in the buffer/multiple use area.
3. **No ‘clear felling’** should be allowed in the forest areas of the buffer/multiple use surround included in the tiger reserve. Such areas should be managed by specially formulated, site specific ‘forest plans’ forming part of village level microplans and should be executed with the active involvement of local communities. Only ‘selection-cum improvement fellings’ should be done with the main objective of sustaining the demands of people living in the area.
4. **Protected Area/Ecotourism activities** in the buffer zone/multiple use areas of tiger reserve **should be fostered** as a component of eco-development with the active involvement of stakeholder communities.
5. **Capacity Building** of field staff as well as Eco-Development Committee members should be undertaken on a regular basis (Project Tiger Directorate, 2004).

3.1.1.5 Examination of consideration of guidelines

Here it will be useful to examine past considerations of this aspect. The Comptroller and Auditor General of India (CAG) in its report (Comptroller and Auditor General of India, 2006) stated that management plans of some tiger reserves were not prepared viz. Valmiki (2000–2004), Melghat, Pench Maharashtra (2000–2004), Kalakad (2001–2002 onwards) and Kanha (2000–2001).

Further as per the guideline from the Wildlife Institute of India in November 1997 (Comptroller and Auditor General of India, 2006), **management plans** would come into

force only if these were approved by the state government and the government of India. The audit reported that in the case of the Simlipal reserve (2001–2011), management plan had not been approved by the state governments concerned. Lack of state government approval affected the project as state's approval was critical in ensuring the flow of matching funds from them.

It is stated in the report that the yearly activities/strategies laid down in the management plan were not reflected in the annual plan of operations for the corresponding period.

The CAG had stated that **annual plans** are to be prepared on the basis of management plans, basing on which the annual plan of operations are approved. It was also stated that plan requests were processed and central assistance released without ensuring availability of approved and valid management plans at Project Tiger Directorate. Besides, in reserves where management plans existed, there were wide deviations between them and the corresponding annual plan of operations. Further in many areas works could not be carried out as funds demanded in annual plan of operations were different from those sanctioned by the government of India. The existence of an inbuilt procedure in the system for accountability and involvement of the Tiger Reserves in the implementation of the schemes had been missing.

It is suggested that:

1. Tiger Reserves should have a well-formulated management plan to ensure that long and medium term targets are not lost sight of. The annual plans of operations should be based on the management plans to ensure judicious allocation of resources. While enabling a planned approach to tiger conservation, it would provide a measure for achievement of targets against efforts made.
2. Efforts may be made to complete the mapping of Tiger Reserves on time so that the management plans are based on reliable information.

The tasks required to be carried out in the Similipal Tiger Reserve have been adequately brought out in the preceding paragraphs. However apart from the laid down business activities in management of tigers' conservation in this forest, there are other services which get rendered which donot appear to be answerable as part of any profit making unit/enterprise. Biodiversity boosts ecosystem productivity where each species, no matter how small, all have an important role to play. For example:

- a larger number of plant species means a greater variety of crops;
- greater species diversity ensures natural sustainability for all life forms;
- healthy ecosystems can better withstand and recover from a variety of disasters.

A healthy biodiversity provides a number of natural services for everyone. Ecosystem services accruing, such as:

- protection of water resources;
- soils formation and protection;
- nutrient storage and recycling;
- pollution breakdown and absorption;
- contribution to climate stability;

- maintenance of ecosystems;
- recovery from unpredictable events.

Biological resources accruing, such as:

- food;
- medicinal resources and pharmaceutical drugs;
- wood products;
- ornamental plants;
- breeding stocks, population reservoirs.

Future resources which could become available:

- diversity in genes, species and ecosystems.

Social benefits accruing, such as:

- research, education and monitoring;
- recreation and tourism;
- cultural values.

3.1.1.6 Some other benefits of tigers' conservation

As per the National Tiger Conservation Authority of India (National Tiger Conservation Authority, 2009, p. 1) since tigers are at the top of the ecological »food-chain«, their conservation results in the overall conservation of all other species of plants and animals occupying the ecosystem. Tigers are indicators of the well being of the ecosystem. A healthy tiger population indicates that the other ecological components in its habitat are equally robust, since tigers need large amount of prey and good habitat. The investments made in a project of this kind are more than justified. Tiger conservation results in several intangible but yet life-supporting benefits too. Some such environmental externalities are:

1. **Carbon di-oxide absorption** (carbon sequestration). Tons and tons of fuel wood are used which release the carbon dioxide back into the atmosphere. Presence of a large quantum of carbon in the atmosphere due to several such emissions at a larger scale increases the »green house« effect contributing to the depletion of the ozone layer which is lethal, and hence the absorption of carbon by the forest vegetation becomes important for our survival, facilitated to a large extent by the forest cover conserved in tiger reserves and other protected areas. Presence of continuous forest cover to a depth of about ten km impacts the climate of the nearby area (almost upto hundred km). This phenomenon is beneficial to both human beings as well as agriculture crops, since they are protected from climatic extremes.
1. **Rainfall.** The evapotranspiration from trees contribute to marginal increase in rainfall in the area, and becomes an additional advantage wherever the ground water is also sufficient.
2. **Water harvesting.** The forest growth reduces the surface run-off and facilitates water storage as well as loss of top soil due to erosion, which may otherwise lead to reduction of impoundment in storage devices. The layer of decaying organic matter on a forest floor and the root system of the vegetation growing on it facilitate infiltration of water.

3. **River flow.** The forest trees conserved in a tiger reserve and other protected areas regulate the water flow. The presence of trees in a catchment area absorbs the water and releases the same gradually. This is beneficial, since on one hand the risk of extreme flooding is reduced, and on the other the flow season is also extended. No singular sustainable livelihood project can deliver such benefits in a »stand alone« manner, since the levels of sustainability are difficult to define, and such levels even when defined always entail compromises, and the net outcome of such trade-offs may not be tiger conservation! The fringe dwellers living around tiger reserves are dependent on forests for their livelihood. Though many of them are not in the food gathering stage, the resource dependency of such people needs to be reckoned for safeguarding the ecological viability of the habitats.
4. There are some other economic benefits to stakeholders. It is by way of availability of plenty of water from the tiger reserve, moderation of micro-climate, non timber forest produce from buffer area, grazing facilities around the villages located within the tiger reserve boundaries and collection of fuel wood, thatching material etc. for bonafide use. Local jeep drivers, tourist guides, shopkeepers etc. are benefited from the tourist activities of the tiger reserve.

3.1.1.7 Eco-tourism

A major area of business of tiger reserves in the country is **eco-tourism**. The National Wildlife Action Plan (hereinafter: NWAP) (Ministry of Environment and Forests, 2002) emphasized the need to develop national guidelines on eco-tourism within protected areas on a priority basis by the end of 2004. The guidelines would address the need for development of tourism management plan for each protected area and conducting surveys for accommodation and tourist facility within the tiger reserves. The need for relocation of tourist facilities outside the tiger reserves, development of stringent standards of waste disposal, energy and water consumption as well as construction plan and material used for construction could also be addressed. Since the tiger reserves are eco-typical repositories of vulnerable gene pool, the guidelines also reiterated the need to ensure that no compromise or trade-off in wildlife interests was made. The guidelines underline the importance of separate tourism management policy and assessment of tourist carrying capacity of the reserves. CAG has stated (Comptroller and Auditor General of India, 2006) that in many Tiger Reserves such as Nagarjunsagar, Palamau, Periyar, Pench (Madhya Pradesh), Panna and Bandhavgarh there was neither a separate tourism management policy nor did these Tiger Reserves assess the tourist carrying capacity of the reserve.

The Wildlife Conservation Strategy 2002 of government of India (Ministry of Environment and Forests, 2002) envisaged that the revenue earned from tourism should be used entirely to augment available resources for conservation. For this purpose, a development fund would be created out of the revenue proceeds. In the case of Simlipal, Orissa revenue receipts realized during 2000–2005 were Rs 49.03 lakhs, but revenue realized from tourism was deposited into government account and no development fund was created.

It is suggested that:

1. Efforts may be made to augment the forest cover of the existing reserves; the proposal to create eight new tiger reserves should be revived. The boundaries of the existing reserves should be notified.

2. Simultaneously, the government should make a firm commitment to relocate the local families/villages from the core and buffer areas of the tiger reserves and draw a comprehensive resettlement plan to this effect, adequately supported by a credible financial package. Stringent steps need to be taken to evict the encroachers.
3. The government should frame a comprehensive tourism management policy for the tiger reserves clearly spelling out the roles of the state authorities as implementers. Tourism should be regulated such that human impact on conservation efforts of ecologically sensitive areas is minimised.

Eco development Activities – Simlipal tiger reserve is coterminous with Simlipal Biosphere Reserve and Simlipal ER. Ecodevelopment activities in the tiger reserve are part of all the programmes in the above projects. As a result there are a number of eco-development activities going on in the villages around the tiger reserves. Main activities are creation and repairs to water harvesting structures and irrigation facilities, sabai rope making, sal leaf plate making, health camps, eradication of malaria etc.

There are no pollution-causing industries in Mayurbhanj district that could affect the ecological soundness of Simlipal. Thus, the ecological vulnerability is only from the current living styles and dependence of people on Simlipal. About 4.5 lakhs people constitute the 80,000 families who live within or close to Simlipal, and about 50% of them earn a part of or the complete livelihood from Simlipal.

Apart from governmental interventions and initiatives at protecting tigers, efforts by various non-governmental agencies including external agencies are present in attempting to mitigate adverse factors for survival of tigers. However no data is available for the whole forests and nor any blueprint is available so as to ensure there are no replication of activities and efforts are appropriately channelized for making them for effective.

There is hardly any weed growth present in the tiger reserve due to high density of crown cover. Studies have been done by creating vegetation plots at sites where unpalatable grasses have established in order to prescribe the habitat manipulation practices.

There are already very limited meadows in Simlipal TR especially in the core area. The only meadows that are present lie in deep valleys prone to frost collection. Studies have been conducted to prescribe proper management practices to check such invasion.

3.1.2 External Analysis

It has been attempted to undertake a political, economic, social, technology, legal, environment-nature or PESTLE analysis based on personal interviews, literatures, reports, etc.

3.1.2.1 Legal issues

Legal Status – Completion of legal procedures is still pending due to **the non-completion of relocation of certain villages** proposed for relocation from the NP. Though relocation is being attempted since 1994, but 221 families from four villages inside the proposed national park or core area still remain to be shifted.

The buffer zone has been well delineated and there were till recently three buffer divisions under the control of the Field Director. However with the creation of a post of Regional Chief Conservator of Forests at Baripada during 2008, the earlier administrative hierarchy has been disturbed. There was unified and effective control of core and buffer till recently with the Field Director.

The problems, which caused the delay in relocating the mentioned villages and its consequences are various.

The appraisal committee on Similipal has stated in respect of an earlier resettlement in Banabasa, the manner in which earlier resettlements in 1994 and 1998 were carried out leaves a lot to be desired. It emphasized that relocations must be carried out with help and advise from competent agencies and/or professionals in a manner that demonstrably improves the well being of the people being resettled (Pandav, Mishra, Yadav & Madhusudan, 2009).

The appraisal committee has noted that despite the availability of money with the local administration, the resettlement process initiated many years ago has yet to see completion. What this underlines is the need to create an institutional mechanism that better coordinates between the civil administration and forest administration to generate and sustain momentum with the proper implementation of voluntary relocation schemes. In every instance where resettlement is credited to have worked, this coordination has had an extremely important part to play in facilitating the process (Pandav et al., 2009).

There are **no commercial forestry operations** being carried out **in the buffer area**. The rights of the villagers (70% of whom are tribals) in respect of grazing, thatching grass, agricultural implements, construction of dwelling huts and non timber forest produce collection etc. are mostly allowed from the buffer area except for four inhabited villages situated in the core, whose rights are met from the core area itself. Apart from 65 villages in the core and buffer area in TR there are nearly 1,200 villages within 10 km from the boundary of the TR. Socio-economic survey of 52 villages indicates pressure for fodder, fuel and NTFP on the TR from these villages. Ecodevelopment programmes in many of the villages are in progress under Biosphere Reserve Programme of Similipal Biosphere Reserve (Project Tiger, 2006).

Livestock grazing pressure is present within the core area and could become a major threat on Similipal's ecosystem. Cultivation by families yet to be shifted is also present in the core, and is giving rise to human-animal conflicts. There is no encroachment in the core area, but problems are there in buffer area.

Collection of NTFP is confined to tribal population living in the core area for their bonafide use. Collection of non timber forest produce in the buffer area is a major cause for depriving food for animals as well as reason for disturbance to wildlife. Further there are no benchmarks as to the sustainable level of collection of these non timber produces.

3.1.2.2 Research and staff training at Similipal reserve

Field data collection and research is continuing in the Similipal tiger reserve. The contribution to research in this TR of Padmashri late S. R. Choudhury, the Founder

Director of Simlipal TR is legendary (Project Tiger, 2006). An appraisal committee has stated that Simlipal has been without a research or veterinary officer or any other kind of scientific support staff for a long while. Similarly, while there is clearly a need, proper outreach and extension support in the form of a social scientist or ecodevelopment officer too is unavailable. It would be useful if the reserve-level Tiger Conservation Foundation, once formed, could provide the platform to recruit people in these roles. These could also become areas of fruitful collaboration between civil society groups and tiger reserve managements. The NTCA must issue advisories mandating these roles in tiger reserves and also provide startup support to such positions. Further, people in these roles need to learn continually, as would other park enforcement staff, particularly with issues such as intelligence gathering, crime investigation and prosecution. This too, must be supported through the NTCA (Pandav et al., 2009). Research activities are currently being undertaken by the faculty from North Orissa University at Baripada and Wildlife Institute of India.

Apart from the training imparted by the visiting tiger reserve officers and Research Officer from time to time and presence of some experienced field staff in the core area, no formal and regular training is being imparted to the field staff. Presence of Padmashri Late S. R. Choudhury, the Founder Director of Simlipal tiger reserve for a long period and his dedication and foresight has left some indelible impressions in the tiger reserve. Some of the field staff trained by him is still to be found here and there in the TR and their dedication to the cause of wildlife can still be felt. Some formal training of short duration to the field staff in wildlife management, handling and care of fire arms, latest trends in the field of wildlife management, identification of flora and fauna specially the birds and orchids, ecodevelopment, public relation, interpretation is an essential requirement.

3.1.2.3 Possibilities of tourism development

Regulation of tourism needs to be done as per carrying capacity. In spite of a large buffer area, some attractive tourist spots such as high and perennial waterfalls and a splendid drive through dense forest areas, the number of visitors is limited to approximately 20,000 per annum. The number of wildlife enthusiasts is limited locally although a large number of outstation tourists coming mostly from Kolkata do visit the Park regularly. Simlipal tiger reserve has very little meadows and forest cover is extremely dense, hence visibility of wild animals during day is very negligible, though large number of elephants, sambars, barking deer, wild pig and cheetal congregate at artificial salt licks created in core area.

There is scope for some regulated tourism through selected forest rest houses without jeopardising the peace and tranquility of the abode of the wild animals. This will enhance the awareness among people about the tiger reserve and vigilance of some more areas. The idea of conducted tours limited to specific numbers can be thought of. Though, some local guides are available they would need more training in interpretation and nature guide programmes. It is mentioned that there exists potential for tourism in the buffer area and the biosphere reserve area. There are no tourism projects where major beneficiaries are the tribals.

92% of the visitors to Simlipal tiger reserve hire vehicles from local market. The drivers and owners of these vehicles have been identified and orientation training to them is being

imparted since 1993. Limited number of nature guides are also involved, who need more training in interpretation etc.

3.1.2.4 Control of wildlife conservation

Wildlife estimation is done regularly. This tiger reserve has the distinction of starting pugmark census of tigers with utmost accuracy since its inception as Padmashree Late S. R. Choudhury, the founder Director of the TR was among the early stalwarts who advocated pugmark census field technique for the big cat. Well rehearsed research has been conducted in pugmark sizes of tigers and leopards as also the sizes of adult, sub adult, cubs and male and female tigers. The territory of male tigers have been identified and marked on the ground with indication of presence of females and cubs in his territory.

Daily monitoring is done through the wireless network of the tiger reserve, which is very effective. The location of a repeater station at an elevation of over 1,000 m helps smooth functioning of the network. All incidents of significance are regularly recorded. Daily patrolling is done in the core area and some sensitive part of the buffer zone. The frequency and strength of patrols increase during the period when the tribals attempt traditional mass hunting and during fire season. Sabuja-Vahini volunteers were used in sensitive periods and sensitive areas.

Similipal lacks in patrolling infrastructure with vacancy in personnel and inadequate protection infrastructure like vehicles, captive elephants, etc. Out of a total sanctioned staff strength of 281 (from the level of Assistant Conservator of Forests to Forest Guard), there were 101 vacancies in the whole of Similipal Tiger Reserve during 2009. Over 50% of all positions were vacant at the time of the extremist attacks, with all 3 Assistant Conservator of Forest positions, 5 out of 13 Range Officer positions, 18 out of 44 Forester positions, and 60 out of 108 Forest Guard positions were vacant. Similipal TR is currently facing a severe crisis as far as staff strength is concerned, although efforts are under way to post 39 forest guards recently recruited by the Orissa Forest Department (Pandav et al., 2009).

In Similipal TR, besides the Deputy Director, the Divisional Forest Officers (hereinafter: DFOs) of its three buffer zone divisions of Baripada, Rairangpur and Karanjia have always reported to the Field Director, Similipal TR, based at Baripada. However, recently, a post of Regional Chief Conservator of Forests (hereinafter: RCCF) was created at Baripada and the previous incumbent in the position of Field Director, Similipal TR, was promoted to this position. In the absence of clear directives from the state government, the DFOs of the three buffer zone divisions of Similipal TR now report to RCCF, rather than to the Field Director. Besides creating considerable confusion, this has effectively undermined the authority of Similipal's Field Director and made the management of the tiger reserve needlessly difficult (Pandav et al., 2009).

3.1.2.5 Threats to the development of Similipal reserve

Prior to it the age-old practice of **mass hunting by tribals** has been a problem. During 9 years from 1992–1993 to 2000–2001, 33 cases of seizure of guns were reported from the tiger reserve, 13 of them from the core area. Organization of local tribal youths in Sabuja-Bahini and their training and motivation by the present Field Director had helped in stopping this illegal practice. However over the last two years large scale ritual hunting by

the local tribals has seen a comeback. Further elephant deaths during the last 8 months have become a major concern.

Due to dense under growth and evergreen forest patches, **incidences of high fires are rare**. Ground fires are controlled with the help of firewatchers and Sabuja Bahini members. Large network of roads (863.5 km) and core line, which is maintained between core and buffer are used fire control lines. Incidence of fires has increased over the last two decades and is bringing in changes to the micro climatic regimes in Similipal.

Similipal faced large scale extremism onslaught on its infrastructure and personnel. A committee was set up by the National Tiger Conservation Authority on 14th July 2009 to visit Similipal Tiger Reserve and undertake (Pandav et al., 2009):

1. an appraisal of the damage to infrastructure/habitat due to left-wing extremism;
2. assessment of present status of tiger, co predators and prey animals, and protection efforts; and
3. provide suggestions for restoring the area and eliciting local support to strengthen protection.

Critical observations are:

- a) Extensive damage to vital park management infrastructure including range and beat offices, forest antipoaching camps, communication networks, and also, to the morale of park staff. As an inevitable consequence, reserve protection has slackened and threats from poaching and smuggling have grown stronger, but there are sincere efforts by the reserve management to re-establish presence and control on the ground.
- b) Reliable reports on recent presence and activity of tigers both in the core and buffer zones of the reserve, and signs of large mammalian prey, but no quantitative tiger or prey population assessments were possible. There are strong indications that the status of the wild dog is extremely precarious in Similipal tiger reserve, and may even be locally extirpated.
- c) Serious challenges faced by the reserve in managing its relationships with local communities along its fringes as well as inside the reserve itself. The reserve and civil administration need dedicated professional/technical support immediately to engage seriously with local communities in and around the park, and particularly, to complete the long-pending process of resettling four villages from the core zone.
- d) Several issues pertaining to staffing policies and human resource management practices of the tiger reserve and state forest department. While seeming like small and routine issues, they have the potential to seriously hamper effective management of the reserve.

The staff stationed inside Similipal TR have been directly threatened by left wing extremists and hostile residents, and are clearly functioning under a serious threat to their lives. Under the prevailing circumstances, it is totally unfair and impractical to expect the staff to continue manning remote stations of Similipal TR even after the infrastructure are rebuilt. Suggest for the deployment of a paramilitary force well-versed in guerrilla combat situations in close consultation with senior reserve officials. They could, with the forest staff of Similipal, jointly patrol the park as well as secure infrastructure. Yet, this recommendation must be made with a few serious caveats (Pandav et al., 2009).

The entire infrastructure and protection mechanism of Similipal TR has suffered a major setback as a result of the attacks. The immediate priority is to rebuild the damaged infrastructure. The rebuilding of infrastructure is not only necessary to establish the resilience of Similipal to such intimidatory attacks, but it is also extremely important to boost the morale of the staff (Pandav et al., 2009).

Similipal has had **serious challenges in its relationship with local communities**, well before the Maoist attacks of March–April 2009. An estimated 250,000 people from nearly a dozen tribal denominations reside in over 400 villages on the fringes of Similipal TR and depend heavily on the Reserve. Within the TR itself, over 12,500 people reside in 65 villages, of which 4 lie within the 845 km² core zone. While some villages do practise agriculture, and such agricultural settlements (particularly along the northern buffer) have encroached into the park, most are heavily dependent on the collection and sale nontimber forest produce for their livelihood. Following the Forest Rights Act, there is a greater sense of entitlement among these communities over forest resources, and the forest department is seen as the single biggest impediment to their pursuit of a livelihood based on the harvest and sale of forest produce. This is surely one of the factors that have contributed to the largely tacit, and at times, express support that Maoists have received from local communities (Pandav et al., 2009).

Four revenue villages (Kabatghai, Jamunagarh, Jenabil and Bakua) and two hamlets (Upper Barahkamuda and Bahagarh) are located within the core zone of Similipal TR, and efforts have been underway to facilitate their relocation, subject to their consent. But for Bakua, which has consistently declined to relocate, 149 families in the other three revenue villages have completed the formalities of land acquisition between 1994 and 2003. Following this, it is reported that 72 families did relocate to facilities in Kopand/Banabasa and Ambadiha, but it appears that the rest changed their minds and continue to remain in the villages. There appear to be moves underway to revise the resettlement package for families that continue to remain inside Similipal. Following the extremist activity and subsequent police action, some of the residents of villages like Jenabil who were previously unwilling to relocate have now sought relocation out of a fear of reprisals from Maoists and questioning by police if they remain inside the TR (Pandav et al., 2009).

Many frontline staff served their entire working life in the core zone of Similipal reserve. Some of these places are extremely remote and prone to malaria. Constant use of anti malarial drugs had had serious side effects (e.g., hearing loss) on staff posted inside the core zone for prolonged periods of time (Pandav et al., 2009).

Given the expansion of agriculture into northern areas of the reserve, and the entry of immigrants into interior villages, and the possible role of ‘outsiders’ in facilitating poaching and smuggling, it would be important to create a simple but robust means (such as an identification card) for distinguishing residents from newcomers. At present, some of these activities may need to be carried out by reviving the Tiger Protection Force and reconstituting it to include members of paramilitary forces, forest staff as well as a dependable cadre of local villagers. In particular, villages like Podadia, Dengam, Badagaon, Dangadiha, Ranibhol, Kendumundi and Tato, which have historically been associated with illegal activities, need to be closely monitored (Pandav et al., 2009).

Overgrazing is the major problem, as goat rearing is very popular here. There are presently 65 villages inside Similipal TR, all of which have a population of goats. An

estimated 7,000 goats from the villages inside the Park and another 70,000 from the peripheral villages of the Sanctuary graze inside the Park daily. This adversely affects wild herbivores like Sambar, Barking Deer, and Gaur. Organised poaching of Elephants, ritual mass hunting (*Akhand Shikar*) of animals by tribals during April, and poisoning is a major problem. *Akhand Shikar* (non-stop hunting) for seven days occurs in April every year.

The tiger population (estimated at 99 as per 2004 census) is concentrated in the core area of 845 sq km due to the extensive disturbance of habitat in the buffer area of 2,200 sq km. There is a big question mark on the future of Simlipal's tigers. Black tigers indicative of genetic aberration have been sighted by forest officials in recent years. Some experts believe that this is the result of inbreeding of tigers since the population is confined to a small patch and no corridors for movement of tigers to other forests like Keonjhar and Kuldiha exist any more. Lack of management resources is another major problem in this large forest. The forest authorities have only four vehicles, shared by five rangers. As many as 40 posts are lying vacant. For the last 20 years, the district authorities were not able to shift four villages from the core area, though the Park authorities have deposited funds for this purpose since more than a decade (Islam & Rahmani, 2003, p. 10).

According to some past park managers (Srivastava & Singh, 2002), the major issues affecting Simlipal and requiring management interventions with research data and support are:

- Man-wildlife interface and mitigation of man-wildlife conflict.
- Management of ecotourism.
- Impacts of incompatible developmental programmes launched by other agencies.
- Biodiversity status assessment and monitoring with particular emphasis on invertebrates and lower plants.
- Impacts of habitat alteration.
- Checking large-scale hunting, illegal extraction of timber and collection of non-timber forest products, human encroachment into forested areas, increasing cattle population, forest fire.

3.1.3 SWOT: Strengths, Weaknesses, Opportunities and Threats analysis

From the internal analysis and external analysis undertaken on the Simlipal Tiger Reserve the strengths and weaknesses, and opportunities and threats, have been brought out. Further through questionnaires and interviews the items have been placed in an ascending order of importance.

Strengths:

1. Large Area;
2. Presence of tiger;
3. Presence of prey species for tiger;
4. Rich biodiversity;
5. Stable and increasing forest cover;
6. Geographical and geological features;
7. Long administrative experience;
8. History of conservation;

9. Strong legal status: Wild Life Protection Act, Tiger Reserve, Wild Life Sanctuary, Biosphere Reserve, Critical Tiger Habitat;

Weaknesses:

1. Slow relocations;
2. Large human population in buffer;
3. Not a major public concern area in comparison to Corbett, Kanha, etc.;
4. Aging forest staff and inability to hire manpower;
5. High staff vacancy position;
6. Low and irregular flow of financial resources;
7. Late release of funds from state government;
8. Plethora of agencies;
9. Overlapping schemes and conservation programmes;
10. Long planning process;
11. Poorer infrastructure;
12. Losing species like *Cuon alpinus*.

Opportunities:

1. Potential to accommodate larger number of tigers;
2. Increasing federal government support;
3. Increasing media and public attention;
4. Global attention;
5. Carbon sinks;
6. Community based tourism;
7. Water reserves;
8. Multidisciplinary approach;
9. Knowledgeable tribals;
10. Tribal life style;
11. Government of India schemes;
12. Large and growing cattle population;
13. Large and growing human population;
14. Research.
15. International concern and recognition.

Threats:

1. Left wing extremism;
2. Alienation of local people;
3. Poaching;
4. Mass hunting;
5. Tribal rituals and way of life;
6. Centre state relations;
7. Forest fires;
8. Tourism;
9. Global warming and desiccation;
10. Industrialization;
11. Chemicals inflow;

12. NTFP collection;
13. Forest land rights act;
14. Urbanisation;
15. Timber smuggling;
16. Proximity to demand centres.

Based on findings of SWOT matrix mission, vision and strategies are proposed.

3.1.4 Mission and vision of Similpal reserve

The vision of Similpal Tiger Reserve which also happens to the vision of tiger conservation in India is to ensure maintenance of a viable population of Tigers in India for scientific, economic, aesthetic, cultural and ecological values, and to preserve for all times, areas of biological importance as a national heritage for the benefit, education and enjoyment of the people (Project Tiger Directorate, 2004, p. 2). The vision of Similpal Tiger Reserve is very wholesome and articulates a view of **a realistic, credible, attractive future for the Similpal Tiger Reserve organization.**

The mission of the Similpal Tiger Reserve is strengthening of protection, creating basic infrastructure for management, habitat development, augmenting water resources, compensatory ameliorative measures for habitat restoration, eco-development, village relocation, use of Information Technology in crime detection, establishment of a digitized database in Tiger Reserves having collaborative linkage with the national tiger conservation authority in the GIS domain, monitoring and evaluation of the tiger reserve, monitoring of habitat status, carrying out All India Estimation of Tigers, Co-predators and Prey animals in the GIS domain with the state of art technology, monitoring of tiger populations in various tiger range states, fostering ecotourism activities in Tiger Reserves, creation/deployment of Special Strike Force for patrolling, providing compensation to villagers for human deaths/livestock depredation by carnivores in tiger reserves, staff welfare measures, replacement and purchase of new vehicles for existing and new Tiger Reserves to ensure staff mobility, providing 'Project Allowance' to all categories of staff working in Tiger Reserves, establishment of veterinary facility, and fostering research/research projects, relating to tiger conservation.

Further the mission of the Similpal Tiger Reserve organisation states the business they are in, communicates the nature of the organisation's existence in terms of purpose, business scope, etc. It provides a framework that regulates the relationships with stakeholders and also states broad organisations' objectives.

3.1.5 Proposal for strategies and tactics

Based on the listing of the strengths, weaknesses, opportunities and threats of the Similpal Tiger Reserve certain strategies and tactics are being proposed.

1. **National park notification.** Early notification of the Similpal National Park.
2. **Criteria for assessment.** Success criteria needs to be adopted for assessing the impact of the tiger conservation scheme and detailed responsibility for each tier of field staff and officers needs to be laid down.

3. **Benchmarking for sustainable use.** Benchmarking for sustainable use of natural resources by local communities needs to be worked out to avoid over utilisation.
4. **Seamless movement of funds.** Direct disbursement of government of India funds to the Field Director of the tiger reserve (like in the case of social sector schemes like National Rural Employment Gurantee Program). The present system of issue of letter of credit (hereinafter: L.C.) should be withdrawn and the flow of fund should be regular, so that activities which are mostly time bound are not hampered.
5. **Manpower norms.** Fixing the manpower norms of frontline staff in each Tiger Reserve with due consideration to the specific eco-systems/habitats in consultation with the concerned state governments
6. **Tiger Conservation Fund.** Setting up of a Tiger Conservation Foundation on a priority basis is required for the Similipal reserve.
7. **Residential quarters.** There should be a residential colony on the fringe of the reserve in the nearby developed town for all forest guards and foresters. This colony should be well developed and have facilities for school, hospital etc.
8. **Subsidized rations.** Forest guards, foresters, range officers and daily-wage laborers staying inside the Reserve should be provided subsidised ration
9. **Adverse posting allowance.** Similipal experiences adverse weather conditions and hostile working conditions. There should be a provision of 'Project Allowance' or 'Tiger Allowance', which should be sufficient to compensate for the adverse conditions, in which staff is working. This should not be less than 40 per cent of basic pay.
10. **Improving transport.** For easy mobility each Range should be provided with a vehicle and each section head quarter should be provided with a motorcycle and wireless network.
11. **Immunity from use of fire-arms.** The forest staff have been provided with the arms, but power to open fire is still not vested with them. The power to use fire arms for protection should be vested with management. In addition Field Director, Deputy Field Director, Assistent Conservator of Forests and Division Forest Officers should be declared as 'Magistrate'.
12. **Prioritizing voluntary relocations.** It is desirable that 65 nos. of villages located inside the Reserve, especially 4 villages located inside the core area and 7 villages located adjoining the core area should be relocated outside the Reserve not only to preserve the 'habitat' in its natural form, but also to check the incidence of smuggling of timber and poaching of wild animals. Voluntary relocation of villages, with financial support from the Union Ministry of Environment and Forests, prioritized on the basis of prevailing ground situation, from inside the Similipal tiger reserve, should be undertaken with involvement of concerned communities, non governmental organisations, anthropologists/sociologists, related government departments etc. with a nodal monitoring agency for this in place
13. **Increasing anti poaching camps.** Number of anti-poaching camps should be increased.
14. **Consolidating inviolate space for tiger.** Consolidation of an inviolate space, by completing the process of relocation of the four existing villages inside the core area that was initiated many years ago, is of utmost importance and need to be pursued with renewed vigour.
15. **Paramilitary force.** Stationing of a paramilitary force, could help Similipal to secure its park staff, rebuild its damaged infrastructure, and strengthen measures against poaching and timber smuggling. This deployment must take a few serious caveats into

account, and be in consonance with larger state and central policies of dealing with left-wing extremism.

16. **Reaching out to local communities.** Alongside measures such as the deployment of a paramilitary force, serious affirmative steps must be taken, based on a sound understanding of the local sociocultural contexts, to regain support of local communities. Constructive attitude and deliberations between the civil and forest administration in this regard must be strongly backed by the civil society.
17. **Tiger monitoring.** The park's current system of monitoring tiger pugmarks on pugmark impression pads, while remaining an important tool for local monitoring of tiger distribution and activity, needs to be continued as it is user friendly for the frontline field staff. However well designed photographic capture-recapture surveys need be used on a periodical basis to estimate tiger numbers.
18. **Alleviation of resource conflict.** Identification of locally appropriate strategies to alleviate resource-conflicts between people and the reserve needs to be explored.
19. **Resolution of administrative issues.** The range of administrative and human resources management related issues pertaining to Similipal Tiger Reserve, and State Forest Department must be decisively resolved, if necessary, by soliciting help from the highest levels of state and central administration.
20. **Skill development.** Development of skills including tranquilization, handling fire-arms, etc. needs to be provided for.
21. **Staff vacancies.** Staff vacancies need to be filled on priority. If necessary, National Tiger Conservation Authority could fully fund these positions and, more importantly, monitor and ensure that there are no vacancies for funded field staff positions.
22. **Time bound promotions for staff.** Need for timely and time bound promotions for staff and personnel of Similipal reserve. Gender equitable approach in staffing needs to be practiced with adequate number of female employees inducted in frontline protection staff.
23. **Conservation priority outside core.** Consolidating buffer and biosphere – there is an immediate need to give conservation priority for wildlife and focus on the forests outside the core. This will ensure space for major wildlife species including the tiger and also ensure maintenance of connectivity and corridors for movements.
24. **Encroachment and grazing.** Encroachment by villagers, illegal livestock grazing, illegal felling and other such actions resulting from law and order failure need to be arrested by strengthening the park administration, boosting its administrative and magistral powers, interdepartmental cooperation, increased backing of staff by senior officers and decentralisation of power in the reserve by enhancing the field director's authority.
25. **'Similipal Appraisal Report.'** Following the March–April 2009 attacks on Similipal, the NTCA had sent a team of experts led by Dr Bivash Pandav to appraise it about the ground situation in the reserve. The team compiled a very exhaustive report and listed very constructive recommendations. Early follow up on the recommendations is required.
26. **Buffer devoid of wildlife.** The buffer zone of the reserve has over the past decades deteriorated tremendously, including in the quality of vegetative cover and wildlife occupation. This is purely because of poor management of the buffer (administered by three Territorial Divisions of the Forest Department viz. Baripada, Rairangpur and Karanjia) from the wildlife conservation perspective. Stringent protection measures need to be put in place and these divisions should ideally be converted into Wildlife Divisions and placed under the charge of the Field Director STR.

27. **Coordination amongst government agencies.** There is a need for co-ordination between various government agencies to eliminate incompatible activities of many departments which impinges upon the protection and development of tiger habitats as well as communities in and around Simlipal Tiger Reserve. Regular local level coordination meetings between the Collector, Superintendent of Police, Field Director as well as elected representatives of people will help facilitate a coherent response.
28. **Regaining local confidence.** There is a need to put in place initiatives which involves the association of the local tribal community in a major way. Tourism ventures need to address the concerns of the tribal community and make them partners in revenue generation.
29. **Developing intelligence network.** Select reserve staff must be trained and motivated to build a strong intelligence network in the villages lying within their beats. The reserve must enable every range officer to operate an intelligence-gathering fund for the purpose.
30. **Imparting skills to the relocatees.** Necessary coordinated initiatives is required between the district administration and Similipal management in ensuring that appropriate levels of skills and training is given to persons who have resettled outside the tiger reserve. Such initiatives will ensure income generation and also enlist support of the families who are yet to voluntarily relocate outside.

3.2 Analysis of organizing function

The Similipal Tiger Reserve organization is headed by a Field Director. The STR organisation is a hierarchical organization, with different levels of government functionaries placed one below the other. The functions of the Field Director include areas of wildlife management, wildlife protection, administration, establishment, finances, planning, etc.

3.2.1 Organization of planning

Planning in India is by annual plans, medium term plans and long term plans. The long term plans in India covers policy formulation in specific sectors. Medium term planning in India is through five year plans. These five yearly plans engage in spelling out strategies and approach for a particular sector including wildlife conservation. At the federal level the Planning Commission of India is the designated authority headed by the Hon'ble Prime Minister. In respect of tiger reserves in India the Planning Commission states that although the utilization of funds in the Tenth Plan period (2002–2007) has been quite satisfactory, the process of allocation of funds to the field is far from satisfactory. There are delays in the submission of Annual Plan of Operations (hereinafter: APO) by the states to government of India which then takes several months to decide how much money should go to which protected area.

The government of India releases the funds in two instalments; the second instalment is released only after the utilization certificate regarding the first instalment is received and this is often delayed. Although the funds released by the government of India should automatically become available to the protected area management for use in case a corresponding provision in the state budget is available, the finance departments of many states further process these releases at their level and cause inordinate delays in making the

government of India funds available to the field officers. Many states use the government of India grants for purposes other than those for which these are meant. Due to the delay in the release and availability of funds, the grants are rarely fully used within the financial year. The unspent balance again goes through the same process of government of India and state level approvals, perpetuating the vicious cycle. The second instalment nearly always remains unspent during the year in which it is released as the release always comes in the month of March. This state of affairs has to be seriously addressed and rectified by the government of India (Planning Commission, 2006, p. 34).

3.2.1.1 Tripartite agreement

The government has approved a **tripartite Memorandum of Understanding (hereinafter: MOU) between the Ministry of Environment and Forests, State Governments and Tiger Reserve Management to ensure effective tiger conservation.** The tripartite MOU is to foster public accountability relating to tiger conservation by ensuring reciprocal commitments between the Centre, the tiger States and the Field Director of Tiger Reserves. It also contains commitments like establishment of Tiger Conservation Foundation which would promote innovative practices for involving the local stakeholders in tiger conservation. This will also ensure better utilization of funds and increases accountability and responsibility for all three parties. The Tiger Task Force constituted by the Prime Minister, in the wake of tigers getting locally extinct from Sariska, recommended a system of MOU with Project States for better implementation.

The additional components include, viz.:

- a) rehabilitation/resettlement of denotified tribes/communities involved in traditional hunting,
- b) mainstreaming livelihood and wildlife concerns in forests outside tiger reserves and fostering corridor conservation through restorative strategy to arrest fragmentation of habitats,
- c) enhanced village relocation/rehabilitation package for people living in core or critical tiger habitats apart from settlement of rights,
- d) safeguards/retrofitting measures in the interest of wildlife conservation,
- e) providing basic infrastructure for strengthening the National Tiger Conservation Authority and establishing a monitoring lab in the Wildlife Institute of India,
- f) establishment and development of 8 new tiger reserves,
- g) provision of project allowance to ministerial staff working in tiger reserves, and
- h) fostering ecotourism, are part of the MOU. The Memorandum of Understanding is to be suitably modified to reflect the responsibilities of the State Governments for delineating the buffer zones and filling staff vacancies.

The refined Memorandum of understanding was developed to include issues that emerged after consultations with tiger management stakeholders. Earlier there used to be a bilateral MOU between the Ministry of Environment and Forests and tiger reserve States, but a tripartite Memorandum of Understanding was considered more effective than the earlier since the Field Director of a tiger reserve is the key functionary vested with the responsibility of day to day management, between the Ministry of Environment and Forests the tiger reserve States as well as the Field Directors of Tiger Reserves. The urgency in saving the tiger, India's national animal, enjoins on the Centre, the States and

the Tiger Reserve Management. A tripartite memorandum is essential, laying out the respective responsibilities and reciprocal commitments linked to fund flows to ensure effective tiger conservation in the country. Tiger conservation is a shared responsibility between the Central and State Governments. The Government of India provides funding support and technical guidance to tiger States for tiger conservation in designated tiger reserves. The day to day management of the tiger reserve including protection is the responsibility of tiger States.

3.2.1.2 Organisation climate and culture

During the course of research undertaken certain critical aspects emerged. The functioning of the Similipal Tiger Reserve organisation is based upon guidelines laid down by the national tiger conservation authority from time to time as well as on directives of the regional government. Here the regional government set-up consists of the forest and wildlife department of the government of Orissa. The Field Director who heads the STR organisation reports to the Principal Chief Conservator of Forests (Wildlife) in the regional government. It thus becomes very important that the purpose and initiatives of both these bodies are in synchronization within the overall objective of management of tigers' conservation in India.

The STR has both the core and buffer areas. The buffer area has developmental initiatives being undertaken by other regional government agencies in which the Field Director does not have a say in formulation and execution. The process of consolidation of the STR has all along been an evolving process whereby timelags in achieving most strategic and tactical goals have led to suboptimal outcomes. Actions like relocation of human settlements has been one such area of concern. Further the STR administration is unable to undertake staffing of manpower and necessarily has to depend upon the overall exercise at the regional government level. This has usually taken a long time leading to vacancies in critical positions. Issues like engaging paramilitary personnel to combat emergent situations like the left wing extremism onslaught are beyond the decision making ambit of the STR administration. It is seen that in most cases the STR administration functions more in the nature of a recommending authority in the whole management process. Posting of officials by Field Director requires the concurrence of the federal and the regional governments and has been observed to be time consuming. In this regard it is suggested to give a fixed tenure to a Field Director and delink it from pay scale and grades of government service.

Engaging personnel for the top management from outside the government may not be a good option, as management scenario in forest areas in India are complex and require past administrative experiences, in order to tackle unforeseen contingencies including law and order. However it is also important to have a permanent Standing Board having representations from all the government agencies functioning in the area, as well as representatives from the wildlife organisations in non-governmental sector. Such a Board should be chaired by the Field Director to provide necessary focus within the overall objective for tigers' conservation.

The issue of poaching engages the STR administration and happens to be one of the critical areas. However it is observed that due to lack of a coordination mechanism which could facilitate exchange of critical intelligence between enforcement agencies and wildlife

organisations, suboptimal outcomes are achieved. It will be important to put in place a mechanism which could meet and exchange information in a structured manner.

The scenario for wildlife conservation in India as a national endeavour gained momentum during the late 1960's and early 1970's, when the federal government got deeply involved into a subject matter which was entirely in the domain of regional governments. Subsequently legislations were brought forth which enabled making conservation efforts more effective not only in tiger reserves but also in other categories of protected areas in the country. In view of a diverse socio-political-economic-setup with many conflicting and competing demands an optimum environment is difficult to come by. This also gets reflected on the STR organisation.

Of late once again the country appears to be according high priority towards wildlife conservation. The STR has a strongly motivated work force working in extreme adversarial circumstances. Strong leadership has been provided on occasions by some team leaders. However it is important extra and liberal decentralization initiatives are facilitated to enable the STR to function in a more efficient and effective manner.

3.3 Analysis of human resource management and leadership function

The staff stationed inside Similipal TR **have been directly threatened by left wing extremists and hostile residents**, and are clearly functioning under a serious threat to their lives. Under the prevailing circumstances, it is totally unfair and impractical to expect the staff to continue manning remote stations of Similipal TR even after the infrastructure are rebuilt. Hence, I see no option but to suggest the deployment of a paramilitary force well-versed in guerrilla combat situations in close consultation with senior reserve officials. They could, with the forest staff of Similipal, jointly patrol the park as well as secure infrastructure. Yet, this recommendation must be made with a few serious caveats. First, even as I recommend the deployment of a paramilitary force, I am keenly aware that at over 4,000 km², the Greater Similipal Landscape is too vast and rugged a tract to be secured effectively even with a large and competent paramilitary force. Second, the problem of left wing extremism affecting Similipal is a bigger issue than is possible to address in an isolated manner within Similipal's boundaries. Strategies to address this issue in Similipal will have to be in consonance with those adopted at the district, state and indeed, national levels. Regular local-level coordination meetings between the Collector, Superintendent of Police, Field director as well as local Members of Legislative Assemblies and Members of Parliament might help facilitate a coherent response.

Out of a total sanctioned staff strength of 281 (from the level of Assistant Conservator of Forests to Forest Guard), there were 101 vacancies in the whole of Similipal Tiger Reserve at the time of the extremist attacks. In particular, at the time of my visit, **vacancies** in the Similipal TR division which comprises the core of the Tiger Reserve, **were at crisis levels**. Over 50% of all positions were vacant at the time of the extremist attacks, with all 3 Assistant Conservator of Forest positions, 5 out of 13 Range Officer positions, 18 out of 44 Forester positions, and 60 out of 108 Forest Guard positions being vacant. Similipal TR is currently facing a severe crisis as far as staff strength is concerned, although efforts are under way to post 39 forest guards recently recruited by the Orissa Forest Department. Unless these vacancies are filled, it is expected very little change will be seen on the

ground. If necessary, NTCA must fully fund these positions and, more importantly, monitor and ensure that there are no vacancies for funded field staff positions.

Many of the field staff are likely to retire in the same post they had been initially appointed, even after having put in about 35 years of service. This deplorable state of affairs is both due to poor human resources management at the state level and also because of recent upgrading the minimum qualification for positions, as a result of which staff recruited under lower qualifying requirements never ever promoted. Time-bound **promotions have to be the introduced** and at least for the old timers, promotion criteria need to be relaxed.

The recruitment policy of the state stipulates that 30% of the staff be women. While this is, in general, an extremely progressive move, park managers express legitimate constraints that this policy imposes when it is extended to the recruitment of core zone field staff. Under the strenuous field conditions of Similipal TR, where forest guards are expected undertake rigorous patrolling. Though it has been suggested that at least the core STR Division should be exempt from this rule, and women already recruited under this policy (about 20+) should be interchanged with male staff from the buffer/circle, yet it will be prudent to adopt a gender equal approach.

During visit to Similipal TR, I have come across many frontline staff who had served their entire working life in the core zone of Similipal TR. Some of these places are extremely remote and prone to malaria. Constant use of anti malarial drugs has had serious side effects (e.g., hearing loss) on staff posted inside the core zone for prolonged periods of time. Specifically, I suggest: one, a generous risk pay component to field staff (Forest Guards, Foresters and Range Forest Officers) to serve as incentive and compensation for the harsh working conditions within the park; two, generous medical insurance cover and a doubling of life insurance cover for field staff during the period when Similipal TR remains under Maoist threat; three, a reliable system of conveying rations and medicines to staff working from field posts; four, a free student hostel at Baripada exclusively for school and college-going children of serving frontline staff; and five, a transfer/policy that ensures that younger staff are preferentially posted to both the core and buffer of Similipal TR and are regularly rotated between core and buffer zones. It is suggested that instead of a generalist approach at human resource management, a more case specific approach for the STR could make management more effective.

3.4 Analysis of control function

3.4.1 Evaluation of management effectiveness

Management effectiveness evaluation is defined as the assessment of how well protected areas are being managed – primarily the extent to which management is protecting values and achieving goals and objectives (Hocking, Stolton & Dudley, 2000, p. 121). The term management effectiveness reflects three main ‘themes’ in protected area management:

1. design issues relating to both individual sites and protected area systems;
2. adequacy and appropriateness of management systems and processes; and
3. delivery of protected area objectives including conservation of values.

Evaluation of management effectiveness is recognized as a vital component of a responsive, pro-active protected area management. As well as being an essential tool at local, regional and national level, evaluation also has an increasing international context. Nations are agreeing to report on progress in conservation to their peers through institutions such as the World Heritage Convention and the Convention on Biological Diversity. In the latter, nations have committed to develop systems of assessing management effectiveness and to report on 30 per cent of their protected areas by 2010. These and other external demands for information on status and trends in protected area management, combined with the need for more data to meet the practical challenges of managing protected areas, have led to a rapid increase in interest in monitoring and evaluation. Four major purposes drive evaluation of management effectiveness (Ervin, 2003, p. 4). It can:

1. lead to better management in a changing environment;
2. assist in effective resource allocation;
3. promote accountability and transparency; and
4. help involve the community, build constituency and promote protected area values.

The range of evaluation purposes combined with the great diversity of protected areas – with different values, cultural settings and management regimes – means that it is not practical to develop a single assessment tool. For this reason, it was instead decided to develop a common framework, which provides a consistent basis for designing assessment systems, gives guidance about what to assess and provides broad criteria for assessment. Based on this framework, different systems using a range of evaluation ‘tools’ can be used to conduct evaluations at different scales and depths.

The Framework for management effectiveness developed by the IUCN World Commission for Protected Areas was published in the first version of this Best Practice Guideline. It is further explained and interpreted, though not substantially altered, in this version (Hocking, Stolton, Courrau, Dudley & Parrish, 2004, p. 3). It is based on the idea that protected area management follows a process with six distinct stages, or elements:

1. it begins with reviewing context and establishing a
2. vision for site management (within the context of existing status and pressures),
3. progresses through planning and allocation of resources (inputs), and
4. as a result of management actions (process),
5. eventually produces goods and services (outputs),
6. that result in impacts or outcomes.

The government of India undertakes an independent management effectiveness evaluation of Tiger Reserves. Such exercises aim to:

- a) To apply the management effectiveness evaluation (MEE) framework and assessment criteria for independent evaluation of the Tiger Reserves in the country.
- b) To evaluate whether the chosen approaches in Tiger reserve management are sound, adequate and appropriate.
- c) To evaluate whether the funds allocated are being used effectively for meeting the objectives of management of Tiger Reserves as laid down in the respective Tiger Conservation Plans/Management Plans.

- d) To evaluate the process and outcome of long-term monitoring of the biological and socio-cultural resources of Tiger Reserves and the impact of management on local communities.

It is suggested that persons who are involved in this exercise need to have prior long term association with the designated tiger reserve. Further as against the current practice of experts assessing the tiger reserve during the course of only a few days, it will be useful if only after round the year assessments, necessary evaluation reports are submitted.

3.4.2 Audit

Audits of accounts of tiger reserves are undertaken by the audit wings of the regional governments. The federal government in India undertakes audit of the project tiger scheme. In this regard it is to mention that the Comptroller and Auditor General of India (hereinafter: CAG) had carried a statutory audit of the Tiger Reserve scheme during 2006. The performance audit of conservation and protection of tigers in Tiger Reserves sought to assess whether:

- a) the efforts made by the government in conservation and protection of tigers has ensured a viable population of tigers in India;
- b) the planning for conservation and protection was adequate and the resources were allocated as per the identified needs and approved prioritization of various activities of the Tiger Reserves;
- c) the targets set in the plan documents were achieved through judicious utilisation of resources;
- d) the efforts made to reduce the biotic disturbance from the tiger habitats caused by human settlements and other land uses were effective; and
- e) there existed an effective system for monitoring and evaluation and a prompt follow up mechanism.

Similipal Tiger Reserve was audited as per the above perspectives. It is suggested that such audits could be made at periodical intervals and on a regular basis.

3.4.3 Tiger Census

In 1932, the world's first tiger census was carried out in the Palamau forests in India. It was based on a pug mark count, and the system was preferred till very recently for both tigers and leopards. This is not because it is considered accurate, but because it is the best of a limited choice of options. Staff and volunteers are usually supplied with a kit bag containing data sheets, a pug mark tracing board and sheets, a measuring scale, marker pens, adhesive tape, plaster of Paris, and a map showing their pre-determined route. Pug marks are commonly located near riverbeds, bodies of water, and well-travelled paths. They are followed until a clear imprint is spotted, then traced. If the pug mark is well-defined liquid plaster of Paris is used to take an impression. Up to 18 parameters may be used to determine the individuality of a pug mark.

A new methodology which adopts combination of methods has been put in practice since 2008. It divides entire country into 5–6 regions. It aims to collect extensive data in each region at forest beat level regarding evidences of ungulates (prey of tigers) & tigers

themselves. Instead of arriving at numbers, it reaches relative abundances or frequencies. On basis of these frequencies, geographical area is stratified & in each strata density of tigers is computed by using refined pugmark method. In this method, pugmarks are captured through digital camera & analyzed by a customized software using Mark Capture Framework. New method also computes density in strata using Camera Trap Method. Hence, density is computed from strata using two separate methods, Refined Pugmark Method in Mark Capture Framework & Camera Trap Method. Density thus computed is correlated with relative frequencies calculated earlier & an indicative number is reached at.

There has not been any reliable analysis to justify rejection of field methods for estimating the tiger populations. The application of statistical approaches is also not unquestionable, nor can its use be undervalued in wildlife conservation. But one cannot deny that many of the available models are primarily untried and un-validated research models. The problems with the hypothetical and un-validated research models are evident from the results of the holistic approach applied by the NTCA. Models for use by field officers are yet to be designed, and India does not have a dedicated wildlife management research cadre. Systems Analysis and Ecological Modeling can become a significant component of wildlife management research and its application in wildlife management in India, only if the results are empirically verifiable by the user at a short notice and found to be closer to reality.

The **current status of tiger populations is extremely tenuous**. Wild tiger populations are faced with the threat of decimation and dying out as geographically segregated genetic isolates. Breeding depressions caused by inbreeding and skewed sex ratios, and the time bound dying out of very small isolated populations will wipe the species out, even if total protection is given to such populations.

The **reliability of pugmarks** as an index for tiger count **has been questioned** and answered over the past two decades. The statistical estimation approaches have also been tried out. The refinement and development of the field methods has been a continuous activity over the past decades. Use of cluster analysis with computer software in West Bengal; refinement of the field data collection techniques, and monitoring of the tiger populations by mapping tiger habitat occupancy patterns have been tried out and validated in the field conditions, tiger census method was also redefined (Singh, 1999, p. 3). These works have not lost their value because of a paradigm shift in monitoring tiger populations.

If we have to approach the application of statistical models with caution, so also we have to exercise discretion and caution in using field methods. Both are subject to human bias. There is science in the field methods, too. The problem lies in the lack of appreciation about when and where to use which approach. We still do not know the true status of tigers in India, nor do we know what methodology to follow in future for monitoring their populations. It is a historical reality that every proponent or supporter of a methodology patronizes a technique or an approach, and expresses greatest confidence in the favored approach. Till date, the firmness of the stands taken by opposite opinion groups regarding mathematical approaches and field methods has been a singular factor that has prevented them from coming together for strengthening the approach for tiger conservation in India. The blind promotion or rejection of any approach will have an effect on the tiger. Therefore, the right way(s) to monitor tiger populations and habitats will be the one(s) that ensure the tiger is benefited from our efforts.

The survival of tiger in India, unfortunately and alarmingly, is pitted in a race against time. We have just about 1,000 tigers in India. Every tiger needs to be watched: numbers cannot be treated as taboo. Reliable monitoring of tigers, their co-predators, prey populations, habitats and their protection are critical for evolving appropriate management strategies for their conservation. We have to change the way we are currently dealing with the remnant tiger populations. A fresh look at both the academic and field approaches is needed.

It is not the academic excellence but the field staff that will save the tiger. The need of the day is to enable the field level manpower with user-friendly methods and techniques that will upgrade their skills in protecting and monitoring wild populations for which they are responsible. There is no harm in trying to reinvent or repair the wheel if the existing one does not work.

3.4.4 Memorandum of understanding

The recently introduced tripartite MOU between Ministry of Environment and Forests (through the National Tiger Conservation Authority), tiger State Governments and Field Director of the Tiger Reserve. has five commitments from the Ministry of Environment and Forests (through the National Tiger Conservation Authority) regarding funding support to tiger reserves, technical guidance and ecological auditing etc. The Similipal Tiger Reserve is also covered under the said scheme. There are 20 obligations of the State Government which, *interalia*, includes preparation of Tiger Conservation Plan, delineation of core, buffer as required under the Wildlife (Protection) Act, release of central assistance by States, posting of motivated officers, filling of vacant posts, constituting State level Steering Committee, regulation of tourism, capacity building of staff, ensuring day to day tiger monitoring etc.

There are 30 obligations of the Field Director relating to day to day management, protection, fund utilisation and involvement of Panchayati Raj institutions. pertains to site specific action for problematic tiger reserves (example those affected by insurgency, fire, flood etc.). The memorandum of understanding prescribes consequences of non-observance of the terms of the MOU like stoppage of funding support, stoppage of second instalment for want of utilization certificate (hereinafter: UC), stoppage of incentives, penal action on the Field Director through the State Government for violation of statutory provisions and loss of tigers and its habitat. It is to be mentioned here that the MOU will act as a benchmark while executing control mechanism in the tiger reserve.

4 POLICY AND OBJECTIVES FOR TIGERS' CONSERVATION IN INDIA

The management of tigers' conservation in India in the Similipal Tiger Reserve has been examined in the preceding chapters. The administration and management of tiger reserve in the Similipal forests is, as per standard objectives and guidelines issued by the government of India. Being policy initiative of the federal government and basing on the findings on Similipal, it is necessary to consider public policy issues involved in tiger conservation in general in India.

4.1 Analysis of public policy of conservation of wildlife species in India

4.1.1 Analysis of public policy until 1970

The rationale for the need for wildlife conservation has been that the exploitation of land and forest resources by humans along with hunting and trapping for food and sport has led to the extinction of many species in India in recent times.

The conservation of wildlife species is necessarily to be seen in conjunction with the conservation and protection of their habitats. India with the variety of natural ecosystems including those of forests, fresh water bodies, marine ecosystem, grasslands, hills and mountains, etc. has been a rich repository of wildlife species.

Due to low human population majority of areas in good old days were devoid of human presence and activities. So much so that large mammalian fauna like rhinoceros were seen in Aligarh very close to the present capital city of New Delhi, not too long ago. Human beings were evolved from hunting and food gathering stage, during which the first direct annihilation of wildlife started for various reasons. This gradually changed to settled habitations where recourse to agriculture and allied activities were initiated. Such habitations were effected by way of clearing natural ecosystems. Competing demands were placed on India's forests and natural areas.

Slowly over the years with such competing demands for space, arose significant measures of protection and preservation. Such initiatives were at the behest of the rulers and monarchies. This can best be seen as an instance of Collectivist practice where the policy on wildlife conservation was decided from the top of the administration and there was practically no delegation or decentralizations.

Certain areas rich in fauna were declared exclusive hunting preserves of kings and emperors i.e. sovereign property rights. This helped in not only preserving wildlife from being over hunted but at the same time catered to the hunting interests of the rich and powerful. Many such hunting preserves are presently national parks and wildlife sanctuaries. Public was allowed to venture inside and they were maintained exclusively for a particular class of citizens.

With the advent of the British colonialism, the controls of majority of India's natural ecosystems were transferred to the hands of the imperial rulers. This is an instance of collective rights being converted to sovereign rights. Once again the policy of all important state was practiced as all measures were undertaken for welfare of the people (with people being of course being kept out of all access!).

The British had introduced **some forms of participatory management for the local inhabitants**. This was by way of access of forest resources, fishing resources, etc. whereby licenses and permits were issued periodically for extraction of these resources. This can be best be explained by Collectivist attitude though property rights continued to be vested with the administrators.

It was during this time that **the concept of National Parks was introduced in India**. The Banjar Valley National Park (later famously known as the Kanha National Park) and the Halley National Park (later famously known as the Corbett National Park) were constituted

by the British in view of the sharp dwindling of some wildlife species. It was understood that wildlife required space for its survival. This was an exclusionist practice of administration, where all human rights ceased to exist once such areas were notified. Apart from this there were certain declared as 'Closed Areas' where hunting was not allowed though all other forms of human activities like fishing etc. were practiced.

The declarations of forests as Reserved Forests put restrictions on people on clearing and felling trees though habitations were allowed to remain inside their precincts termed. This is instance of usufructs. Such villages are differentiated as Forest Villages from Revenue Villages. During course of time certain more categories of forests were notified, viz. Protected Forests, Village Forests, Demarcated Protected Forests, etc. where rights of people existed alongside restrictions on clearing the natural vegetations. Here the state conferred rights and society emphasized. Issues of unconditional welfare, benevolent state, state being the provider, etc. are seen (Bailey, 2002).

Wildlife prospered where there were no hindrances and where the carrying capacity of the habitats exceeded the level of exploitations. Vast swathes of India's natural ecosystems were teeming with wildlife species till the advent of modern development.

Alongside with hunting, vast tracts of natural areas were diverted for developmental needs. It was during this time that conservation in the modern sense got practiced in Africa, America, etc. India also undertook policy initiatives in this regard. The legislation of the Wildlife Protection Act 1972 was one such. This policy which advocated for setting aside areas for strict use by wildlife can be termed as a practice of collectivism. The government viewed the natural resources as public goods and policy and decision making was centralized. Property Rights were vested with the Government (Bailey, 2002).

4.1.2 Some specific characteristics of wild life protection in India

It is in this juncture that the peculiar circumstance of wildlife conservation in India needs to be understood in the perspective of India's federal polity. India is union of states where there are certain functions demarcated between the Federal, State and Local Governments. The subject of 'Wildlife and Forests' were in the State list, meaning that there was no role for the Federal Government. However from early 1970's this subject was placed in the Concurrent List, whereby both the Federal and State Governments have rights to exercise. The process from state list to the Concurrent List can be explained as centralization as against decentralization as mandated by Public Policy. But such centralization can be explained due to the need to safe guard Public Goods and Public Property.

So in final analysis the forests and other natural ecosystems where wildlife resides are instances of Sovereign (state) Property where Collectivism came to be practiced. Such practice was basically under the premise that collective property rights make people worse off, like grazing, over-fishing, damage to natural environment, overuse of wilderness areas, etc. (Tragedy of Commons). So natural resources like wildlife and forests are instances of pure public goods/services where negative rights of Libertarians are exercised as they are non-rival in use.

The issue of participatory management of natural resources gained ground globally during the 1980s. In India the practice of voluntary protection of forests by way of Joint Forest Management started taking roots during this time. Such initiatives were both in respect of plantations and natural regenerations of forests. Such practice vested rights on

the local communities apart from vesting rights in locals for patrolling and protection. In some instances fines and penalties started being levied by such forest protection committees. This practice can be seen as decentralization, private property rights to limited extent, etc. though having restrictions on sale of produce etc. This can be explained as a Neo-Liberal philosophy. So here certain private property rights were permitted to be exercised in public goods (Bailey, 2002).

Simultaneously local communities which were practicing wildlife conservation since ages like the Bishnois in Rajasthan etc. were promoted. This can be best seen as an example of Local Governance where there were almost no policy initiatives from the higher forms of administration including financial assistance.

So overall the **practice of wildlife conservation considers private property rights as unethical**, may allow owners to deplete resources and so deny their use by future generations. It recognizes that tragedy of commons occurs because of unrestricted access. Open access, as these are pure public goods, denies access to all as it is considered that it will deplete wildlife, destroy forests, destroy wilderness areas, etc.

Subsequently the demand for land rights and access to forest resources gained momentum in India during the late 1990s. This has led to legislations whereby land rights have been allowed to be vested in traditional inhabitants. Further recognition has been given to the new shift in wildlife conservation, where **apart from the state, the local community is also to undertake direct conservation initiatives**. This is best seen in the new protected areas; Conservation Reserve and Community Reserve. Decision making has been decentralized to quite a large extent to the local level by way of constitution of management committees, which is to include elected representatives, non-governmental organisations and representatives of local community. However it has also been laid down that once such areas are notified their denotifications can only be possible with the consent to the federal and regional governments. Private property rights have been allowed to be available as rights of individuals continue in such areas. Here private rights have been allowed in pure public goods.

Further in the case of management of the other categories of protected areas like the Wildlife Sanctuaries, National Parks and Tiger Reserves, also decision making has been decentralized by way of constitution of management committees, which is to include elected representatives, non-governmental organisations and representatives of local community. So here also decentralization has come in (Bailey, 1999).

Global concerns at disappearing and extinction of wildlife species including the tiger required landscape level conservation initiatives. Here India also modulated its conservation methodology by bringing in conservation of biospheres, landscapes, etc. Though such areas were not afforded strict protected area status as those under the Wildlife Protection Act 1972, yet considerations of biodiversity is to be form a major part of overall planning for land use in such designated areas. Restrictions on land use were more minimal, and core zones were set aside where no activities were permitted. Certain areas were interface areas, buffer areas, and multiple land use areas.

India has practiced and adopted species specific approach for conservation of wildlife. While a specific approach has been adopted in the case of marine wildlife, a distinct approach has been adopted for its mega fauna like the Tiger and Elephant.

After independence the government of India at the federal level was seized of the matter. The large scale unregulated hunting combined with destruction of habitats was instrumental for dwindling of numbers of various species. It was here that legislations in the public policy area were brought in. They included bringing in the concept of 'usufructs' and also introduced 'sovereign' property rights over wildlife resources. It may be mentioned that 'usufruct' and 'sovereign' or 'public' rights existed on floral resources mainly trees prior to this phase by way provisioning for 'reserved forests' and 'protected forests'. But it was felt wildlife required a separate treatment which was more focused as per the needs then. Such new initiative can be explained to be an 'evidence based' public policy initiative. The international concern on the fast extinction of the tiger was a major reason; once again an instance of evidence based policy (Bailey, 2002).

4.2 Laws pertaining to wildlife protection in India

4.2.1 Wildlife Protection Act

The Government of India enacted Wild Life (Protection) Act 1972 (The Wild Life (Protection) Act, 1972) with the objective of effectively protecting the wild life, including the tiger, of this country and to control poaching, smuggling and illegal trade in wildlife and its derivatives. The Act was amended in January 2003 and punishment and penalty for offences under the Act have been made more stringent. The objective is to provide protection to the listed endangered flora and fauna and ecologically important protected areas. As per the statute, »animal« includes amphibians, birds, mammals, and reptiles, and their young, and also includes, in the cases of birds and reptiles, their eggs. It lays down that no person shall hunt any wild animal specified in Schedule, I, II, III and IV. The Wildlife Protection Act 1972 recognizes different categories of protected areas including national parks, wildlife sanctuaries, conservation reserves, community reserves, tiger reserves, etc.

4.2.2 Biodiversity Act

India is party to the Convention on Biological Diversity (CBD) 1992 which recognizes the sovereign rights of states to use their own Biological Resources. The Biological Diversity Act 2002 (The Biological Diversity Act, 2002) was born out of India's attempt to realise the objectives enshrined in the United Nations Convention on Biological Diversity (CBD) 1992 which recognizes the sovereign rights of states to use their own Biological Resources. The Act aims at the conservation of biological resources and associated knowledge as well as facilitating access to them in a sustainable manner and through a just process. The principles of 'usufructs' over collective rights were recognised. Further the public policy process was made participatory.

Apart from the above legislations and policy frameworks which exist strictly for wildlife species conservation, there are legislations which provide for conservation of ecosystems thereby ensuring the conservation of wildlife species including for the tiger as below.

4.2.3 Scheduled tribes and other traditional forest dwellers (recognition of Forest Rights) Act

The Scheduled tribes and other traditional forest dwellers (recognition of forest rights) Act, 2006 (The Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006), recognizes the rights of forest-dwelling Scheduled Tribes and other traditional forest dwellers over the forest areas inhabited by them and provides a framework for according the same. This legislation also recognizes for constituting Critical Wildlife Habitats, including for tigers, for stringent protection where no rights to traditional dwellers are to be given.

4.2.4 Forest Conservation Act

The Forest Conservation Act 1980 (The Forest (Conservation) Act, 1980) was enacted to help conserve the country's forests. It strictly restricts and regulates the de-reservation of forests or use of forest land for non-forest purposes without the prior approval of Central Government. To this end the Act lays down the pre-requisites for the diversion of forest land for non-forest purposes. This legislation puts restriction on the dereservation of forests or use of forest land for non-forest purpose. It states that no state government or other authority shall take measures for:

- a) dereserving any reserved forest;
- b) any forest land for any non-forest purpose;
- c) lease any forest land or any portion;
- d) clear trees which have grown naturally in forest land for the purpose of reafforestation.

Tigers inhabit natural habitats outside the protected areas in India. So in such cases the tiger's habitat i.e. forests also got protection accordingly.

4.2.5 Indian Forest Act

The Indian Forest Act, 1927 (The Indian Forest Act, 1927) consolidates the law relating to forests, the transit of forest-produce and the duty leviable on timber and other forest-produce.

4.2.6 National Policy on Wildlife Conservation

Some important points of national policy on wildlife conservation are (Ministry of Environment and Forests, 2002):

1. Wildlife, including tigers, and forests shall be declared priority sector at the national level for which funds should be earmarked.
2. Law enforcement agencies must ensure that those engaged in poaching, illicit trade in wildlife and wildlife products, destruction of their habitat, and such other illegal activities are given quick and deterrent punishment.
3. We should fully tap the potential in wildlife tourism and at the same time take care that it does not have adverse impact in wildlife and protected areas. The revenue earned from increased tourism should be used entirely to augment available resources for conservation.
4. Protecting interests of the poor and tribals living around protected areas should be handled with sensitivity and with maximum participation of the affected people. They should have access to the minor forest produce, in the forest outside of national parks and sanctuaries. Employment and means generation for these people is crucial for

maintaining symbiosis between the forests, wildlife and the people. People should be encouraged to take up afforestation and conservation in new areas.

5. While strengthening protective measures against traditional threats to wildlife, we should also respond to newer threats such as toxic chemicals and pesticides.
6. There should be greater governmental as well as societal recognition and support for the many non-governmental organisations engaged in wildlife conservation. Mainstream media to better highlight their activities as also successes of governmental initiatives that have worked.
7. No diversion of forest land for non-forest purposes from critical and ecologically fragile wildlife habitat shall be allowed.
8. Lands falling within 10 km of the boundaries of National Parks and Sanctuaries should be notified as eco-fragile zones.
9. Removal of encroachments and illegal activities from within forest lands and Protected Areas.

No commercial mono-culture to replace natural forests.

4.3 Governmental efforts in tiger conservation in recent years

Initiatives taken during recent times by the Government of India for conservation of tiger (Rajya Sabha, 2010a) are as follows:

4.3.1 Legal and administrative steps

The following legal and administrative measures have been undertaken since 2006:

1. Amendment of the Wild Life (Protection) Act, 1972 for providing enabling provisions for constitution of the National Tiger Conservation Authority and the Wildlife Crime Control Bureau.
2. Enhancement of punishment in cases of offence relating to a tiger reserve or its core area.
3. Strengthening of antipoaching activities, including special strategy for monsoon patrolling, by providing funding support to tiger reserve states, as proposed by them, for deployment of antipoaching squads involving ex-army personnel/home guards, apart from workforce comprising of local people, in addition to strengthening of communication/wireless facilities.
4. Constitution of the National Tiger Conservation Authority with effect from 4th September 2006, for strengthening tiger conservation by, interalia, ensuring normative standards in tiger reserve management, preparation of reserve specific tiger conservation plan, laying down annual audit report before Parliament, constituting state level Steering Committees under the Chairmanship of Chief Ministers and establishment of Tiger Conservation Foundation.
5. Constitution of a multidisciplinary Tiger and Other Endangered Species Crime Control Bureau (Wildlife Crime Control Bureau) with effect from 6th June 2007 to effectively control illegal trade in wildlife.
6. Declaration of nine new tiger reserves and in-principle approval accorded for creation of three new reserves, namely Pilibhit in Uttar Pradesh, Ratapani in M. P. and Sunabeda in Orissa.

7. The revised Project Tiger guidelines have been issued to states for strengthening tiger conservation, which apart from ongoing activities, *interalia*, include funding support to states for enhanced village relocation/rehabilitation package for people living in core or critical tiger habitats (from Rs. 1 lakh/family to Rs. 10 lakhs/family), rehabilitation/resettlement of communities involved in traditional hunting, mainstreaming livelihood and wildlife concerns in forests outside tiger reserves and fostering corridor conservation through restorative strategy to arrest habitat fragmentation.
8. A scientific methodology for estimating tiger (including co-predators, prey animals and assessment of habitat status) has been evolved and mainstreamed. The findings of this estimation/assessment are bench marks for future tiger conservation strategy.
9. An area of 31,207.11 sq km has been notified by 16 tiger states (out of 17) as core or critical tiger habitat under section 38V of the Wildlife (Protection) Act, 1972, as amended in 2006 (Andhra Pradesh, Arunachal Pradesh, Assam, Chhattisgarh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Mizoram, Orissa, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal). The state of Bihar has taken a decision for notifying the core or critical tiger habitat (840 sq km). The state of Madhya Pradesh has not identified/notified the core/critical tiger habitat in its newly constituted tiger reserve (Sanjay National Park and Sanjay Dubri Wildlife Sanctuary).
10. Financial and technical help is provided to the states under various centrally sponsored schemes, viz. Project Tiger and Integrated Development of Wildlife Habitats for enhancing the capacity and infrastructure of the states for providing effective protection to wild animals.

4.3.2 International Cooperation

1. India has a memorandum of understanding with Nepal on controlling trans-boundary illegal trade in wildlife and conservation, apart from a protocol on tiger conservation with China.
2. A Global Tiger Forum of tiger range countries has been created for addressing international issues related to tiger conservation.
3. During the 14th meeting of the Conference of Parties to CITES, which was held from 3rd to 15th June, 2007 at The Hague, India introduced a resolution along with China, Nepal and the Russian Federation, with directions to parties with operations breeding tigers on a commercial scale, for restricting such captive populations to a level supportive only to conserving wild tigers. The resolution was adopted as a decision with minor amendments. Further, India made an intervention appealing to China to phase out tiger farming, and eliminate stockpiles of Asian big cats body parts and derivatives. The importance of continuing the ban on trade of body parts of tigers was emphasized.
4. Based on India's strong intervention during the 58th meeting of the Standing Committee of the CITES at Geneva from 6th to 10th July, 2009, the CITES Secretariat issued notification to Parties for submitting reports relating to compliance of Decisions 14.69 and 14.65 within 90 days with effect from 20th October 2009 (Progress made on restricting captive breeding operations of tigers etc.). During the 15th meeting of the Conference of Parties, India intervened for retaining the Decision 14.69 dealing with operations breeding tigers on a commercial scale.

4.3.3 Reintroduction of tigers and creation of special tiger protection force (STPF)

1. As a part of active management to rebuild Sariska and Panna Tiger Reserves where tigers have become locally extinct, reintroduction of tigers/tigresses have been done.
2. Special advisories issued for in-situ build up of prey base and tiger population through active management in tiger reserves having low population status of tiger and its prey.
3. The policy initiatives announced by the Finance Minister in his budget speech of 29th February 2008, inter alia, contains action points relating to tiger protection. Based on the one time grant of Rs. 50.00 crore provided to the National Tiger Conservation Authority (NTCA) for raising, arming and deploying a Special Tiger Protection Force, the proposal for the said force has been approved by the competent authority for 13 tiger reserves. Rs. 93 lakhs each has been released to Corbett, Ranthambhore & Dudhwa Tiger Reserve for creation of STPF during 2008–2009. Since then, the guidelines of the STPF have been revised for deploying forest personnel in place of Police as an option-II, with scope for involving local people like the Van Gujjars.
4. In collaboration with TRAFFIC-INDIA, an online tiger crime data base has been launched, and generic guidelines for preparation of reserve specific security plan has been evolved.

4.3.4 Miscellaneous

1. Implementing a tripartite MOU with tiger states, linked to fund flows for effective implementation of tiger conservation initiatives.
2. Rapid assessment of tiger reserves done.
3. Special crack teams sent to tiger reserves affected by left wing extremism and low population status of tiger and its prey.
4. Chief Ministers of tiger states addressed at the level of the Minister of State (Independent Charge) for Environment and Forests on urgent issues, viz. implementation of the tripartite MOU, creation of the Tiger Conservation Foundation, stepping up protection etc.
5. Chief Ministers of States having tiger reserves affected by left wing extremism and low population status of tiger and its prey addressed for taking special initiatives.
6. Steps taken for modernizing the infrastructure and field protection, besides launching 'M-STrIPES' for effective field patrolling and monitoring.
7. Steps taken for involvement of non-governmental experts in the ongoing all India tiger estimation.
8. Special independent team sent to Simlipal for assessing the status, besides constituting State level Coordination Committee for redressing the administrative problems.
9. Issue of tiger farming and trafficking of tiger body parts discussed at the level of Minister of State (Independent Charge) for Environment and Forests with the Chinese Authorities.
10. Action taken for amending the Wildlife (Protection) Act to ensure effective conservation.
11. Initiatives taken for improving the field delivery through capacity building of field officials, apart from providing incentives.
12. Steps taken for the independent Monitoring and Evaluation of tiger reserves.
13. Action initiated for using Information Technology to strengthen surveillance in tiger reserves.

14. Providing special assistance for mitigation of human-tiger conflicts in problematic areas.
15. As an outcome of the fourth Trans-border Consultative Group Meeting held in New Delhi, a joint resolution has been signed with Nepal for biodiversity/tiger conservation.

4.4 Achievements of Project Tiger

As per the National Tiger Conservation Authority of India (National Tiger Conservation Authority, 2008) the achievements of project tiger are:

- Project Tiger has saved the endangered tiger from extinction, and has put the species on an assured path of recovery by improving the protection and status of its habitat.
- The Project coverage has been increased from 9 tiger reserves in 1973 to 39 tiger reserves at present. Further, approval has been accorded for designating 4 more tiger reserves, based on proposals received from states.
- The core buffer strategy of Project Tiger has provided scope for eliciting local public support through site specific ecodevelopment in the buffer/fringe areas.
- □The Project has contributed towards several intangible environmental benefits to society, such as absorption of carbon dioxide, improvement of micro climate, rainfall and river flow.
- The Project has generated considerable wages for the benefit of fringe dwelling communities, who are deployed as local work force for protection.
- While conserving the flagship species, the Project has saved several other species of plants and animals from extinction.
- □The local communities are benefiting from eco-tourism apart from ecodevelopmental inputs in fringe areas.
- The Project has served as a role model for wildlife management planning, habitat restoration, protection and ecodevelopment. States have been provided funding support for enhancing protection through deployment of local work force, ex-army personnel. The field staff has been provided allowance as an incentive for working in difficult conditions.
- Independent monitoring of tiger reserves has been undertaken by a panel of experts, based on the framework of the World Commission of Protected Areas of the International Union for Conservation of Nature and Natural Resources (hereinafter: IUCN).
- □The All India Estimation of tiger, co-predators and prey animals has been refined by Project Tiger in collaboration with the Wildlife Institute of India, with a peer review mechanism comprising independent experts, both national and international (IUCN).
- The tiger habitat of the country has been evaluated in the GIS (Geographical Information System) domain at the tehsil level. The status and changes of forest cover within tiger reserves upto an outer surround of 10 km radius distance has been assessed in collaboration with the Forest Survey of India, for facilitating restorative action.
- The Zoological Survey of India and the Botanical Survey of India have been co-opted for bringing out compendia on faunistic and floristic surveys in tiger reserves.
- In a pilot e-governance initiative, five tiger reserves have been linked with the Project Tiger Directorate in the GIS domain.

On the illegal wildlife trade linkages, reports are received from various sources in various countries, and action is taken wherever necessary in respect of any connected crimes on Indian soil. **The ongoing demand for tiger body parts** catering to the traditional Chinese medicine and the practice of tiger farming in China **are causes for great concern**, owing to their deleterious effect on the status of wild tigers in India. Alerts have been issued to the concerned Police and Forest Departments to step up vigil in the tiger habitat and its surroundings including bus/railway stations. Joint operations have been undertaken by various agencies to pursue linkages. The issue of illegal trade has been taken up for inclusion in the agenda for the Foreign Office Consultations with Myanmar and Nepal. A Special Coordination Committee, comprising various intelligence, security and enforcement agencies, has been formed and checks are conducted at the exist points by various agencies (Rajya Sabha, 2010b).

5 ISSUES IN MANAGEMENT OF TIGERS' CONSERVATION IN INDIA AND PROPOSALS FOR MANAGEMENT OF WILD TIGERS IN INDIA

On the basis of experience gained from management of the Similipal Tiger Reserve and the policy of tigers' conservation in India, and from findings during research, important issues of concern are being discussed.

5.1 Inviolate space for tigers

It is imperative to note that all the **'potential tiger habitats** in the protected areas of India, add up only to 100,000 sq km and populations where reproduction is taking place now **occupy less than 20,000 sq km**. This is a relatively small fraction of India's huge rural poor population is exposed to tigers. The premise that there are vast areas of India where tigers and people must be forced to co-exist through some innovative scheme of increased use of underutilized forest resources by involving the local people does not make any sense to tiger conservation especially when the **human and cattle populations are constantly rising**.

The fact is each tiger must eat 50 cow-sized animals a year to survive, and if you put it amidst cows and people, the conflict will be eternal and perennial. Tigers continue to lose out as they did in Sariska (and over 95% of their former range in India). The premise of continued co-existence over vast landscapes where tigers thrive ecologically, as well people thrive economically, is an impractical dream. Such dreaming cannot save the tiger in the real world. On the other hand such a scenario will be a »no win« situation for everyone and result in further declines and the eventual extinction of tiger populations. Alternatives where tigers have priority in identified protected reserves and people have priority outside them have to be explored fast and implemented expeditiously (Ministry of Environment and Forests, 2005, p. 15).

The unregulated biotic pressure has resulted in a **conflict of interests between the local population and the forest management** with the real threat of large scale destruction of wildlife habitat looming on the horizon. Encroachments, delayed settlement of rights of the people and the diversion of forests for ill conceived projects have compounded the

problems. In this background the populist approach of liberally regularizing encroachments and grant of pattas in forest areas and management interventions in the form of dry bamboo extraction, underplanting, etc. meant further fragmentation inviting irreversible ecological disaster. Ultimately the tiger itself was to be on the brink of extinction.

Tiger populations breed well and grow rapidly in population in habitats without incompatible human uses. They cannot co-exist with people particularly in a situation where both human impacts and livestock grazing are continuously on the increase. In the Ranthambhore Tiger Reserve the tiger has gone locally extinct in Kela Devi Sanctuary and Sawai Mansingh Sanctuary in the year 2005. The reason for this is the presence of 52,510 goats, 10,178 buffaloes, 4,928 cows and even 37 camels. Not to talk of 40 villages and their ever increasing human population. The long term survival of tigers will therefore depend on how secure and inviolate are the protected areas in which they live (Ministry of Environment and Forests, 2005).

A Parliamentary Committee during 2005 (Ministry of Environment and Forests, 2005, p. 16) observed the dismal scenario of presence of major wildlife species like the tiger in India. It stated that by merely including endangered species of animals in Schedule I of the Wildlife (Protection) Act, 1972, may not be enough. It stated that the government should also take some stringent measures along with enforcing the provisions of the Act for their survival.

The Task Force on Tigers (Ministry of Environment and Forests, 2005, p. 26) stated that it is important to focus on enhancing the protection of tigers in the short-run and earmark inviolate spaces for its existence. There is no alternative opinion that such spaces need to be provided for the tiger to survive in India.

5.2 Presence of humans in tiger reserves

One of the main thrusts of Project Tiger is protection and mitigation of negative human impacts for comprehensive revival of natural ecosystems in the Tiger Reserves and to create favourable atmosphere to increase the tiger population. Hence, to a great extent, the success of the Project Tiger depends on the relocation of persons living in the core and the buffer areas of the Tiger Reserves. Records in PTD indicated existence of 1,487 villages with 64,951 families in the core and buffer areas in 26 out of the 28 Tiger Reserves as of July 2005. The distribution of villages and families in the Tiger Reserves since their creation in core areas and critical tiger habitats may be seen at Appendix 7.

The current cost of relocation of a family is Rs 10 lakh which was enhanced recently. There is priority need for allocating the required funds for voluntary relocations.

The Planning Commission of India has suggested (Planning Commission, 2006, p. 34) that there is an urgent need to launch a rehabilitation and development programme for the denotified tribes and tribes involved in traditional hunting, living around tiger reserves and tiger corridors. The following denotified tribes/communities are involved in traditional hunting of wild animals: *Behelias, Ambalgars, Badaks, Mongias, Bavariyas, Monglias, Boyas, Kaikads, Karwal Nat, Nirshikaris, Picharis, Valayaras, Yenadis, Chakma, Mizo, Bru, Solung* and *Nyishi*. While this list is not exhaustive, around 5,000 such families are required to be taken up under a welfare programme (forming part of NTCA initiatives)

during the Plan period. The rehabilitation/welfare package should be evolved in a site specific, consultative manner with livelihood options, to include : wages for such people towards their deployment in foot patrolling for protecting wildlife, providing agricultural land with irrigation, basic health care, housing and related community welfare inputs and basic education facilities. The experience gained in the past for settling denotified tribes by the salvation army is required to be considered dispassionately while structuring the programme.

5.3 Encroachments and other external negativities

As per the Wildlife Protection Act 1972, no person other than that specified in the Section shall enter or reside in a Sanctuary or a National Park except and in accordance with the conditions of a permit granted. The CAG had reported (Comptroller and Auditor General of India, 2006) that encroachments were widespread in several tiger reserves affecting the quality of conservation adversely. Land pertaining to tiger reserves was encroached upon either by communities or by private companies and the states had not been able to remove the encroachments with the result that protected areas were subjected to increasing biotic pressures. Encroachment in reserve areas intensified the biotic pressure on them and undermined tiger conservation efforts.

In addition to encroachment, CAG had observed that (Comptroller and Auditor General of India, 2006) owing to the undesirable activities of Electricity Boards, Tourism, Irrigation Departments etc., there was heavy biotic pressure on Nagarjunsagar, Periyar, Ranthambore, Sariska, Corbett, Panna and Kalakad Tiger Reserves. Besides, Nagarjunsagar, Valmiki, Melghat, Bhadra and Periyar Tiger Reserves were also facing biotic pressure due to permitted activities such as highway and roads and places of worships. The unregulated local expansion of agriculture and chaotic delivery of development within and around tiger habitats continues to fragment existing habitats and populations. Very little has been done, either in terms of law or policy, to address threats to tigers arising from poor and unplanned land-use. The tiger requires inviolate space for surviving and such adverse impacts needs to be mitigated.

5.4 Fragmented habitats

If a wildlife habitat is small, it will have a small population of top carnivores like tiger. Smaller populations promote inbreeding and therefore remain vulnerable on a long run due to inadequate genetic diversity. National Wildlife Action Plan (NWAP) emphasized the need for identification and restoration of linkages and corridors between wildlife habitats so as to provide gene continuity and prevention of insular wild animal population by 2004. National Wildlife Action Plan also contemplated recovery plans of degraded areas in Tiger Reserves by 2004. It may be mentioned that the need for the establishment of a network of corridors was recommended in a review report conducted by the Steering Committee way back in 1985. The delay in the implementation needs to be viewed in this light.

It is suggested that:

1. Priority should be accorded in the tiger reserves for eradication of weeds, availability of grasslands and abundant water resources to ensure sustenance of tiger population.

2. The network of corridors for connecting the tiger reserves with the protected areas and other forest areas should be established without further delay.

5.5 Viable tiger population

The Project Tiger started with the prime objective of attaining a viable population of tigers in the country. The National Tiger Conservation Authority is working on acceptable norms of sustaining a viable tiger population in reserves. The tiger population does not increase exponentially over the years nor is there any defined rate of increase every year and the difference in population estimates over the years should not be construed as a failure of conservation as the real tiger numbers in the country were never free from controversy. The status of habitat was more important and relevant in the present context rather than tiger numbers. Tigers have a short gestation period and a remarkable power of recovery if the habitat is well protected and sustainable. Biotic disturbance in the form of human settlements and other land uses in the tiger reserves in addition to non compliance with its conservation directives by the states were the contributory factors for the shrinkage in the tiger population and the situation is being remedied with the creation of the National Tiger Conservation Authority with statutory provisions for addressing tiger conservation in tiger reserves. Though the prime objective of the Project Tiger was to attain a viable population of the tigers in the country, acceptable norms for sustaining viable tiger population is yet to be framed and the net increase in tiger population in 15 Tiger Reserves over 18 years after introduction of this scheme was only 20.

Conservation and protection of tigers in Tiger Reserves reveals that Government efforts had helped in bringing into focus important conservation issues needing attention, such as ecosystem approach, human dimensions in wildlife conservation, eco-development in the surroundings of the Tiger Reserves and had also drawn attention to wildlife conservation in general. There was a decline in the tiger population in many reserves. Conservation efforts in the Tiger Reserves by and large remained ineffective due to inordinate delays in the settlement of acquisition rights under the Wildlife Protection Act 1972, inadequate wildlife corridors connecting Tiger Reserves with other Protected Areas, slow progress of relocation of villages outside the Tiger Reserves as well as poor tourism management. The Government efforts at conservation and protection of tigers were at crossroads due to several long-standing problems. To make tiger conservation more meaningful and result oriented will need evolving the most appropriate mechanism to implement the project to save tigers and realize the goal of a viable tiger population in the country.

5.6 Corridors

Tigers live alongside some of the densest and fastest growing human populations in the world. To successfully conserve tigers in an increasingly human dominated landscape, there is need for an initiative to identify and create safe passages for at least some tigers to move between protected core populations and throughout the human landscape. There is a need for regional, bi-national, and national tiger corridors that ensures linked networks of healthy, genetically-related tiger populations. The success of this effort is predicated on protecting and increasing key tiger populations throughout tiger range, then predicting or creating potential tiger travel routes through the human-dominated landscape. To accomplish this, tiger experts and detailed geographic databases are needed to accurately

pinpoint current tiger populations, suitable or potential tiger habitat, and likely **dispersal corridors between tiger populations**.

Because tiger dispersal is still so poorly known, Creating a geographically-based model to predict routes of travel that provide the most secure passage with the best available habitat, is required. After potential tiger corridors are identified, they need to be verified on the ground to ensure that these areas indeed possess the attributes that a tiger will need while traveling or establishing a new range. Information such as presence of tiger prey, current land use activities, future development projects, socio-economic data, and social attitudes towards tigers need to be used to assess suitability of the corridor. If a potential corridor has become too degraded, habitat restoration efforts may be carried out or alternative routes of travel will be identified. All efforts to create the corridor will necessarily need to include local and regional stakeholder involvement. The success of the corridor throughout the human landscape will only come with the understanding and acceptance of the people and communities being asked to live among tigers.

5.7 Central assistance to states

The details of central assistance allocated and released for tiger conservation in designated tiger reserves under the ongoing Centrally Sponsored Scheme of Project Tiger, alongwith utilization pertaining to last three years and the current year, are at Annexure. The National Tiger Conservation Authority has been reconstituted with effect from 4th September 2009. The ongoing Centrally Sponsored Scheme of Project Tiger has been revised in January, 2008 to strengthen tiger conservation. Allocation of funds for tiger reserves in states over the years may be seen at Appendix 8.

Since its inception in 1973 till 2008–2009 (a period of 25 years), the Central government has provided Rs 250 crore as financial assistance to the parks. This includes provisions for ecodevelopment and beneficiary oriented tribal development schemes, meant to relocate tribals from within tiger reserves. Over time, the funding mechanism for the programme has changed. Till 1979–1980, Project Tiger was completely funded by the Centre. Then in the 6th Five Year Plan (1980–1985), Central funding for recurring items was reduced to 50 per cent; now, states had to contribute a matching grant for the same. This arrangement persists till today: states spend 50 per cent on recurring salaries and establishment costs, while Central assistance is used for non-recurring costs related to the maintenance and protection of tiger reserves. The Central government also pays the entire cost of relocation of villagers from tiger reserves, research projects and ecodevelopment projects. However delays in releases to the tiger reserve managements continues to be an area of concern.

5.8 Competition for space

The Task Force on Tiger has stated (Ministry of Environment and Forests, 2005) that it is important to design policies and actions which are multi-pronged and which:

- safeguard the future of the tiger by involving local communities with reciprocal and collaborative models, to share the benefits of conservation; and
- involve local communities in rebuilding the forest economies of the tiger's habitat so that all can grow.

The Task Force on Tiger had stated this is the paradigm of 'inclusive growth' that will safeguard the Indian tiger: the Indian model of conservation. Nothing else. India's primary tiger habitat is spread over vast areas of central India, and the Western and Eastern Ghats. These are also the areas where the majority of our scheduled tribes live. These lands are enormously rich in natural resources – forests, minerals – but the irony is that the people living in them are among the poorest in the country. The other key tiger habitats are in the Himalayan region and its foothills.

These lands – the habitat of tigers as well as people – also provide most of central and peninsular India with its water. They are the source of the water that irrigates farmlands, that villagers drink and that cities guzzle freely, exchanging it cheaply with their excreta. These forests are essential for our survival. We need them for ecological security – to replenish water systems, provide habitats for wild species and as our biodiversity treasure troves. We also need them for economic security – for firewood, fodder, building material for people and raw material for industry. While managing forests for such distinct objectives is complicated enough, what makes the issue more difficult is that there are poor people living on these lands. They need this land for their survival. The question is, what is to be done with these people.

It is suggested that:

1. Government should lay down a clear-cut agenda for co-existence by addressing the needs of the people sharing habitat with tigers and at the same time ensuring that eco-sensitive areas are protected from human disturbances, without diluting the conservation efforts.
2. Project Tiger office should exercise control over eco-development projects, both funded internally and aided by external agencies.

5.9 Local extinction of tigers

The Sariska tiger crisis is symptomatic of most of India. In 2004–2005 local extinctions have taken place not only in Sariska Sanctuary but also in Kela Devi Sanctuary in Rajasthan. These two sanctuaries between them lost 24 tigers. There was also a sharp decline of 21 tigers in Ranthambhore Tiger Reserve. All the seven tigers in the Palpurkuno Sanctuary and all the six tigers in Rani Durgawati Sanctuary in Madhya Pradesh have been wiped out and became locally extinct. The decline across the North East including Nandapha and Dandapha Tiger Reserves coupled with the declines in places like Palamau Tiger Reserve, Valmiki Tiger Reserve, Dudhwa Tiger Reserve, Indrawati Tiger Reserve, Panna Tiger Reserve and Nagarjuna Sagar Tiger Reserve reflect the grim national scenario.

The States have obviously not given the required priority to the issue of conservation and protection of tigers notwithstanding the existence of many reports, recommendations and the Wildlife Action Plan that are drawn up from time to time after involving experts at the national level (Ministry of Environment and Forests, 2005). The nonimplementation of the National Wildlife Action Plan (2002–2016) (Ministry of Environment and Forests, 2002) particularly stands out starkly in this regard. The tremendous pressure on forests and the unsustainable levels of biomass removals by local people as well as by the forest department and rampant grazing have adversely affected the National

Parks/sanctuaries/reserve forests. Here is an instance of usufruct not being properly enforced.

In the case of the Panna Tiger reserve it has been stated that tigers have become locally extinct in Panna largely due to poaching (Rajya Sabha, 2009a).

As events around the extinction of tigers in India's Sariska Tiger Reserve have shown (Wildlife Institute of India, 2005), there are also serious systemic problems with the implementation of tiger conservation in the subcontinent. Although the focus of forest departments managing tiger conservation have changed over the decades and now include wildlife conservation, these departments often continue to function in an exclusionary authoritative manner, rather intolerant of questioning and scrutiny, particularly from the public and civil society. Such conduct becomes a serious conservation threat, particularly when management activities carried out by forest departments are based on a shallow understanding of ecological science or are sometimes carried out with dishonest and corrupt motives not only of the bureaucracy itself but also of its political masters. The sinking of dozens of waterholes, the creation of extensive road networks in protected areas, the construction of scores of check-dams and watchtowers, programs of habitat manipulation through fire, grazing, felling and other extraction, all ostensibly as wildlife management tools, are simply not borne out by any conservation need, or worse, they actively undermine conservation (Johnsingh et al., 2010, p. 35).

Management plans do not exist for most wildlife reserves, and where they do, they are either not scientifically reviewed for their conservation implications or are implemented very differently from the approved plan. Yet, even as the system flounders, there are always some remarkable examples of mature handling of conservation problems by individual forest officials who are committed to conservation, capable of grasping its complexities, and willing to innovate (and even subvert the existing system) in order to score victories for conservation (Johnsingh et al., 2010, p. 34).

5.10 Tigers outside tiger reserves

Also, the task force was conscious that maintaining a genetically viable population of tigers would require larger areas than the reserves and their contiguous forests provided. The members strongly ruled against any operation to hold tiger populations at artificially high levels by using methods like habitat modification or artificial breeding. They believed, instead, that the reserves would provide a breeding nucleus from which surplus animals could disperse into surrounding habitats (Indian Board for Wildlife, 1972). As per the above table, the population of tigers outside the reserves was 2,502 as of 1984 and declined to 1,765 by the end of 2001–2002. During the same period, the population of tigers in the reserves increased from 1,121 to 1,141. The protection of the tiger is inseparable from the protection of the forests it roams in. The carnivore-human conflict has exacerbated: the truth of its exponential growth is visible in and around most tiger reserves. So is the visible degradation of the forest, at once source of people's livelihoods and the home of the tiger. The public policy question then is: how do we protect the tiger? How do we regenerate these lands? How must we manage the competing, but equally vital, needs of human livelihood? We don't have the option to choose one over the other: the poverty of one will destroy the other. Unfortunately the human population has been growing rapidly making use of natural resources in the tiger forests unsustainable.

5.11 Low density of tigers

On the issue of Low density of tigers in reserves it has been stated that advisories have been sent to eleven tiger reserves having low tiger density for in-situ build up of tiger and its prey populations within the tiger reserve. These include Dampa, Kalakad Mundanthurai, Valmiki, Indravati, Manas, Nagarjunasagar Srisailem, Namdapha, Sanjay Dubri, Buxa, Palamau and Similipal tiger reserves. This active intervention has been suggested simply as an 'augmentation process' to save tigers from local extinction on account of poaching and other causative factors including left wing extremism, without compromising the protection/safeguards for tiger population outside such enclosures.

5.12 Forest cover

The State of the Forest Report, 2003, clearly brings out that the forests having more than 70 per cent density is only 51,285 sq km (1.56 per cent of this country's geographic area). Further, an area of 26,245 sq kms (0.75 per cent of country's geographic area) of dense forests having more than 40 per cent density has been lost in just two years. Out of this area of 26,245 sq kms of dense forests, a total of 23,140 sq kms is in potentially rich tiger habitats and includes, among others, States like Assam, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Uttar Pradesh and Uttranchal. The trends revealed in this latest report are exceedingly grave and disturbing and, if not reversed, could have serious consequences for the tiger's forests. There would be 300,000 sq kms of potential tiger habitat. Less than 10% contain breeding population. The Forest Survey of India (Forest Survey of India, 2004) states that the country has lost 26,245 sq km of dense forests between 2001 and 2003. On the other hand, the open forests – forests with a crown density of only 10 to 40 per cent – have increased by 29,000 sq km. The country had 11.88 per cent of its geographical area under dense forests, of which only 1.56 per cent could be classified as very dense, with a canopy cover of over 70 per cent. As much as 63 per cent of the dense forest in the country is in its tribal districts. This, as we have said earlier, is also the tiger district. The maximum loss of dense forest cover has also occurred in these very tiger-tribal districts. The tiger's habitat is under threat. The people's livelihoods are impoverished. There are millions who live in these forest lands.

5.13 Tiger in the 11th plan period

As per Planning Commission of India (Planning Commission, 2007, p. 56), Project Tiger was launched in 1973 and produced significant results. Considering the urgency of the situation faced by the tiger population in India, Project Tiger has been converted into a Statutory Authority (NTCA) by providing enabling provisions in the Wildlife (Protection) Act, 1972 through an amendment, viz. Wildlife (Protection) Amendment Act, 2006. This forms one of the urgent recommendations of the Tiger Task Force appointed by the Prime Minister. It has been stated by the Planning Commission that the NTCA would address the ecological, social, as well as administrative concerns for conserving tigers, by providing a statutory basis for protection of tiger reserves, apart from providing strengthened Institutional mechanisms for the protection of ecologically sensitive areas and endangered species, and positively engaging local community members in conservation efforts.

The prerequisites for efficient management, namely, filling up vacancies of frontline staff, providing necessary inputs for capacity building for working in conservation areas, management planning in conformity with the acceptable principles of participatory processes and scientifically sound systems for documentation and monitoring of the key constituents of the habitats will be set up:

- Identification of the villages feasible for relocation in the existing tiger reserves will be completed for making suitable provisions in the annual plans. The resources for this purpose will be earmarked in the Annual Plans based on the project reports based on feasibility.
- Village Eco development will be the core activity in the Project. The assistance for the tiger reserves will be linked to the eco development strategy based on micro plans developed with full participation of local communities.
- Specific arrangement for documentation of landmarks and progress based on socio-economic, population, habitat and ecological indicators will be laid down for effective monitoring of the impact of management inputs in the tiger reserves.
- For notification of any new tiger reserves, norms will be finalized based on scientific data as well as assessment of impact on local communities.

Tiger conservation received a major focus from the Planning Commission of India, which lays down a vision for a period of 5 years (2007–2012) (Planning Commission, 2006). During present plan period, 100% Central Assistance is being made available to States for expenditure on all non-recurring items; for recurring items, the Central Assistance is restricted to 50% of the expenditure, while the matching grant is provided by the Project States. Management of forests and wildlife is primarily the responsibility of concerned states. The field implementation of the project, protection and management in the designated reserves is done by the project states, who also provide the matching grant to recurring items of expenditure, deploy field staff/officers, and give their salaries. The Project Tiger Directorate of the Ministry of Environment and Forests was mandated with the task of providing technical guidance and funding support. The Planning Commission recognizes that the Tiger Reserves are faced with ecological disturbances and various other problems. Fragmentation of habitats occur owing to overuse of forest habitats, apart from conflicting land uses leading to loss of habitat.

There are also in some cases, significant village population with large number of cattle, which graze in the forests, leading to ecological degradation, apart from major sources of regular or intermittent disturbance, such as temples and commercial entities such as tea estates. This also leads to man-animal conflicts, resulting in tiger and prey mortality. Several constraints affect field implementation of the project, viz. delayed release of Central Assistance given to the States for Field Units, staff vacancies, ageing of field staff, lack of capacity building initiatives, weak enforcement and monitoring of protection work etc.

The events in the recent past have highlighted the fact that there is a need in the States for greater commitment and vigilance. The field administration managing the tiger reserves require capacity building and supervision. There is also an urgent need to strengthen the system at the Central Government level (Project Tiger Directorate), which has the mandate to oversee and guide tiger conservation in the country. Involvement of Parliament is also required to ensure review and guidance. Likewise, involvement of Chief Ministers of states and strengthening the field administration, supervision of the project and building a participatory base by including interests of local people living in and around tiger reserves

are extremely important. Considering the urgency of the situation, Project Tiger has been converted into a Statutory Authority (NTCA) by providing enabling provisions in the Wildlife (Protection) Act, 1972 through an amendment, viz. Wildlife (Protection) Amendment Act, 2006. This forms one of the urgent recommendations of the Tiger Task Force appointed by the Prime Minister. The NTCA would address the ecological as well as administrative concerns for conserving tigers, by providing a statutory basis for protection of tiger reserves, apart from providing strengthened institutional mechanisms for the protection of ecologically sensitive areas and endangered species. The Authority would also ensure enforcing of guidelines for tiger conservation and monitoring compliance of the same, apart from placement of motivated and trained officers having good track record as Field Directors of tiger reserves. It would also facilitate capacity building of officers and staff posted in tiger reserves, apart from a time bound staff development plan.

5.14 Translocating tigers

The government has embarked upon an exercise of reintroducing tigers to areas where they have become locally extinct. This approach appears to be founded on a principle that habitats devoid of tigers could soon lose their protected status and also invite public criticism. However the larger question of accountability in failure to prevent the local extinction of tigers remains unanswered. The question is whether such approach is good and sustainable in the long run. Governments relocate individual animals after following an extremely well laid down protocol, including advanced techniques like DNA analysis. However the issue of being able to sustain tiger numbers in their own habitats is a crucial factor or in other words in-situ conservation. Secondly populating a natural habitat by bringing in tigers from outside may bring in complacency in management. This may also adversely impact on the system of accountability and control.

5.15 Landscape level interventions

The emphasis on economic growth at all levels across the subcontinent has eclipsed ecological concerns in the planning and implementation of commercial and development projects even in and around wildlife reserves. In India, environment impact assessments instituted to foster ecologically responsible development have often failed to protect tiger habitats against seriously damaging development projects (Saberwal, Rangarajan & Kothari, 2001, p. 26). It has been stated by the Planning Commission from past and ongoing experience planning for protected areas or other specific sites as isolated patches within the larger landscape/seascape, without co-terminously reorienting the planning for the latter, creates various problems of sustainability, incompatibility, and conflicts. No »island« of conservation will survive for long if its surrounds are getting degraded, or if activities that are damaging the »island« from outside its boundaries are not tackled. The concept of ecosystem or landscape or ecoregional planning is gaining ground across the world, and India too needs to apply it. This is particularly challenging not only because wider landscapes encompass a wide variety of land/water uses and many different rights-holders and stakeholders, but also because they often cut across political boundaries such as State or international borders.

5.16 Community or state driven approach?

The need for more inviolate spaces for the tiger works contrary to the competing demand for space by the local communities. There are arguments that community driven initiatives could offer major solutions in this direction. However this issue needs to be considered as below:

1. **Considerations of protected areas** in the present context is going to be consultative and participatory with all stakeholders. Local communities on them including tribals and other traditional forest dwellers etc. possess some of the finest traditions in conservation. However biodiversity is a complex phenomenon and human beings, be they the educated and urban citizens or be they the local and traditional communities, understand only a part of it. There is an immediate need to conserve the whole biodiversity alongwith the tiger.
2. One of the major reasons for depletion of natural resources in this country is **an ever increasing anthropogenic pressures, and ever increasing cattle**. Fortunately for many reasons, the threat of over utilization of the natural resources in many parts of the country is still absent, not because of the fact that they have been conserved by local and traditional communities, but because of the fact that sourcing the supplies from these tracts have till date remained uneconomical. With a globlized economy and a global demand and supply position, the threat to India's biodiversity looms large.
3. Some of the best conserved natural habitats fall under the exclusionist category of protected areas viz. National Parks, core areas in tiger reserves, etc.
4. We also understand that land use and competing demands for rights on land as property is **an evolution of private property rights over the state rights**. We really do not have bench marks as to what exactly is sustainable use of natural resources. We need to any how ensure that our natural habitats do not suffer from the phenomenon of the 'tragedy of the commons'.
5. It is also to be understood that like humans who need space, wild species also need them and with humans being the superior of the lot, the onus for providing such space happens to be on the latter.
6. Retaining inviolate **spaces of major species like the elephant and the tiger requires large tracts of natural habitats**. Most of the times the traditional communities donot have the capacities to be able to achieve this inviolate spaces are required for nurseries of the diverse biodiversity.
7. The major segment which gets affected by diversion of natural habitats are the local communities and tribals. Also the major beneficiaries of a well preserved and conserved ecosystem is again the local community and tradional dwellers first and then others. It is in the best interests of the tradional dwellers that biodiversity is conserved to the fullest be they water sources or wild plants etc.
8. While arguing for more inviolate areas for the tiger, we **also need to ensure that traditional dwellers are made stakeholders in any revenue generating venture**. Today we are discussing about a 25% stake for tribals in industrial projects. This can be replicated for ventures like medicinal tourism, tribal tourism, wildlife tourism, adventure tourism. We need to ensure that the economic activities are in the hands of these traditional dwellers. If the local capabilities and capacities of the local communities are not of the level required for them, then India needs to take care in ensuring them by capacity building and skill developments.

At the same time the traditional top-down preservationist thrust of India's conservation efforts has recognized the threats that humans pose to wildlife, entrusted management to authoritarian forest departments, and sanctioned coercive means to restrict and exclude human resource use in wildlife reserves. While **the preservationist approach** is essentially correct in its recognition of conflict between prevailing forms of human resource-use and the needs of wildlife conservation, it may not be the optimum option for resolving this conflict. It has rigidly relied on coercive means to restrict human resource-use regardless of context, with no serious effort to create enabling circumstances for local communities to participate – or, at a minimum, even to co-operate – in the state's conservation efforts.

Further, there has been little effort to recognize or offset the human/livelihood costs of conservation, including a loss of subsistence options, threat of displacement, as well as material, monetary, and human losses in human-wildlife conflicts, all of which are borne disproportionately by local communities. In particular, the recognition of the costs of the human-wildlife conflict has been extremely poor among both conservationists and managers. Moreover, compensation schemes to offset losses in human-wildlife conflicts do so at archaic rates, involve tedious and complex paperwork, and are dogged by systemic problems such as corruption and inefficiency. Given the continued losses faced by people in conflict with wildlife, and the absence of readily available measures to offset these losses, there is considerable local animosity toward wildlife conservation and support for activities that undermine conservation.

5.17 International experience and cooperation in tiger conservation

Severe fragmentation of present-day tiger habitat as well as the existence of one extant island population, mandates the design of several tiger corridors. Some of the important the multi-national corridors which needs to be consideed are Himalayan-Indo-Malayan corridor, potentially connecting tiger populations from Nepal into Bhutan and Northern India through Myanmar, Thailand, Lao P.D.R., Cambodia, and terminating in Malaysia. Other important genetic corridors include a bi-national China-Russia Tiger Corridor, connecting Siberian tiger populations of Sikhote Alin, Russia and Heilongjiang and Jilin Provinces, China, a national tiger corridor through the island of Sumatra, and several possible Indian corridors, particularly the Western Ghats of Karnataka State. Today we have some shining examples of governments striving to change their approaches.

Among the most progressive measures are the efforts of **Nepal** to restore 50% of the habitat in the Barandabhar, Khata, and Basanta corridors, reduce retaliatory killing of tigers by 50%, and streamline a compensation mechanism for conflicts and measures to reduce the number of poaching and smuggling incidents (Ministry of Forests and Soil Conservation, 2007). One stretch of habitat where Nepal's conservation attention is needed is the Churia and foothill forests between the eastern part of Sukhlaphanta Reserve (the northern part of which is connected to the foothill forests) and the Sharada river, so as to create the Brahmadev corridor across the river to connect with the 1,200 km² intact forests on the Indian side. This may one day enable tigers to range from the forests on the west bank of Yamuna to Sohelwa.

Bhutan has brought 70% of its tiger habitat under protection in the form of protected areas and biological corridors; and in the absence of significant levels of poaching, tigers are

likely to persist in this mountainous tract albeit at a low density (Tshering & Wangchuk, 2003, p. 19). One region where Bhutan, India, and possibly Tibet need to cooperate is in creating a tri-junction Peace Park encompassing Pangolakha WLS (128 km², Sikkim), Neora Valley NP (88 km², West Bengal), Torsa Strict NR (651 km², Bhutan), and parts of Chumbi Valley (Tibet) to bring back species such as tiger, gaur, and red deer (*Cervus elaphus wallichi*). The greatest hope against extinction of this species will be the ability of young, dispersing individuals to make their way to other tiger populations. As with other large, wide-ranging species, a long-term conservation strategy must go beyond isolated protected areas and plan for ways in which animals can move and survive in human-dominated landscapes. The corridor initiative is a daunting, highly ambitious plan but well suited to one of the world's most daunting, magnificent wild creatures.

5.18 Ecological services

Currently, this ecological service being rendered by the reserves is not rewarded:

- The dam in Pench tiger reserve provides water to the city of Nagpur in Maharashtra.
- The dam in Periyar tiger reserve in Kerala is used for towns and agriculture in the neighbouring state of Tamil Nadu.
- The town of Sawai Madhopur in Rajasthan gets its water through deep tube-wells at the edge of the Ranthambhore tiger reserve.
- The city of Tirunelveli in Tamil Nadu gets its water from the dam in the Kalakad-Mundanthurai tiger reserve.

But none of these cities, states or towns pays for the conservation of these watersheds. There is a cost to bear for their conservation though – the cost of conserving the forests that keep the watersheds alive. The *State of Forests Report 2003* (Forest Survey of India, 2003) has, for the first time, assessed the water bodies – rivers, streams, lakes, ponds and wetlands – located inside forest areas. It estimates that 17,396 sq km of water bodies exist within the forested areas of the country. The role of forests in maintaining the hydrological cycle of the country is critical. In addition, there is the biodiversity value of forests. Currently, there is no mechanism to account for these services which standing forests and protected areas provide to the country. It is today an imperative to ensure that these costs are internalised. Therefore, we need to incorporate the principles of valuing forests for the tangible as well as intangible benefits these lands provide. This cost must be paid to the communities who live in and around these forest lands. They bear the cost of maintaining these watersheds. To maintain these forests demands the people who live in and around these forests forego the developmental fruits that the rest of the country enjoys at their cost. Therefore, they must be compensated for protecting these natural resources at the cost of their own economic and social development.

This concept of an ecological tax – paid for water, recreation or other services that these reservoirs of biodiversity provide – is gaining ground across the world. At present, there exists a provision to calculate the net present value (hereinafter: NPV) of forests, and pay an amount when they are diverted for non-forest purposes. But this is nothing but payment for destruction. In that sense, it is a negative approach of providing value to forests. This is not a payment to protect forests as forests and for keeping them inviolate. Also, the money goes to a central authority, not to the state that has diverted its forests. The money also does not go to the community that bears the cost of 'diversion'. There is no incentive to

protect forests, as there is no value of standing forests. In fact, the 'burden' of conservation has grown over the last few years.

An analysis of the revenue and expenditure of the state forest sector shows that conservation is costing forest-dependent states enormously. While the revenue generated by the states from forests have dwindled, expenditures have mounted. The situation is such that India, today, has become a major importer of wood – that is to say, from forests cut elsewhere. By 2001, India's export of forest-based products stood at Rs 4,459 crore; the major items were rubber and paper products. But imports were over a whopping Rs 12,000 crore – three times higher. That year, the country spent over Rs 2,000 crore simply on importing wood. The repercussions are at three levels. One, the country loses precious foreign exchange. Two, the country keeps its own millions of people deprived of economic development. And three, the costs of maintaining these forested areas are borne by state governments whose budgets are reduced and who have less and less money for development programmes. Economic valuation of forests offers a methodology to quantitatively calculate the benefits that forests provide, and also helps elucidate who are benefiting from the forest, and who are bearing the costs of conservation. tiger reserves to carry out an evaluation of the ecosystem services that accrue to the nation from the reserves, and must formulate the mechanism for charging the city/area/districts that get water from the watersheds secured by this reserve, and sharing the revenue so earned between the reserve authorities and the people in and around the reserve in an equitable fashion.

5.19 Tourism

Tourism must have a purpose, which promotes conservation and livelihood security. R Sukumar of the Centre for Ecological Sciences at Bangalore has noted that »a new wave of luxury tourism now threatens to unleash across our protected areas«. The problems are manifold. In many protected areas there has been relocation of tribals and cultivators from within to outside the parks. The virtual take-over of protected areas by luxury tourism would open fresh wounds in the yet to heal conflict between parks and people. The issue of profits from tourism being ploughed back into the local economy as well as park management also has to be seriously addressed. In addition, there is a need to ensure that critical corridors and ecologically important areas are not used for tourist activities. At the same time the impacts of tourism in the tiger reserve must be studied carefully so that base line data on carrying capacity is used to monitor change. Thereafter periodic review studies of the different impacts of tourism must be carried out. This will enable in formulating evidence based policy.

Again, as these periodic monitoring either by experts or under their guidance shall require resources, it is essential that the park dedicate some of the revenue generated by tourism into the tourism impact monitoring mechanism. Tourism has a large potential for involving people in the forests and it is also a way of paying back people the value of the ecological services the forests provide to the society. While other forms of payments to the community for protection of forests – joint forest management and other mechanisms – are also explored today across the world, the best form of payment for ecological security can only come from a rights-based approach. In this, people get preferential chances to earn resources from an activity that not only generates enough revenue to keep them from being alienated, but also helps foster a relationship between the forests, the forest department and

the people inside and along fringes. Today we have a situation where monetary/livelihood benefits of conservation and revenues from nonconsumptive use in wildlife reserves, such as skyrocketing tourism revenues, have rarely accrued to local people in any significant way. Understandably, this has fomented local anger against conservation, which manifests in deliberate forest fires, retaliatory killing and poisoning of wildlife, and colluding with poachers and smugglers, all of which have significantly undermined tiger conservation.

5.20 Poaching

The direct poaching of tigers to supply high-value markets trading in tiger body-parts remains one of the most serious threats to the species in the subcontinent. Among the prominent reasons for the intensification of this threat is the poor protection and law enforcement in many wildlife reserves. In addition, this threat remains because of the inability to curtail the well-organized regional networks of illegal wildlife trade catering to an unrelenting demand from Tibet, China, and parts of Southeast Asia for tiger parts. The growing indifference and animosity towards tiger conservation among local communities has often taken the form of support for activities such as tiger poaching, further aggravating this serious threat.

India has set up a Wildlife Crime Control Bureau, supposedly a multi-disciplinary body to tackle wildlife crime. Presently it is staffed with personnel from the police and forest wings. There is an immediate need to include personnel from critical enforcement agencies like the Customs, Border Security Force, Coast Guard, etc. to make it more effective and multidisciplinary as envisaged. Further there is also an immediate need to factor wildlife crime control within the functioning and institutional structures of enforcement agencies including the Customs, Directorate of Revenue Intelligence, etc. Powers to prosecute need to be given to officials from the Customs and Central Excise department, Coast Guard, Border Security Force, etc. There is need for more effective coordination at the field level and also to ensure strengths of existing statutes including the Customs Act to be put to optimum use of. Poor investigations have ensured that offenders are not convicted in a majority of cases. There is a need to develop expertise in this regard.

5.21 Extraction of natural resources

Among the biggest threats facing the tiger, its prey, and its habitats across the densely populated subcontinent is the dizzying suite of chronic and widespread extractive uses of natural resources. These range from the local hunting of tiger prey to meet tradition-driven demands for wild meat (Madhusudan & Karanth, 2002, p. 10), and the grazing by millions of livestock that transmit diseases and outcompete the herbivore prey of tigers even in important habitats (Madhusudan, 2004, p. 9), to the stealing of tiger kills, the harvest of vast quantities of fuelwood (Shankar, Hegde & Bawa, 1998, p. 8) and a wide range of nontimber forest products (Shahabuddin & Prasad, 2004, p. 1) from tiger habitats. Although the natural resources extracted under these regimes often directly meet the subsistence needs of economically marginal communities, faraway markets are increasingly forging close and complex linkages with traditional resource-use systems (Madhusudan, 2005, p. 7).

5.22 Census methodology

India currently practices a capture-recapture statistical method in enumerating tiger numbers. This appears to be more suited for core areas of some tiger reserves. Any methodology needs to pass the test of effectiveness, transparency, people-friendliness/usability and inclusiveness. In the case of tigers this approach needs to recognize the role of the cutting edge element of forest conservation i.e. Forest Guard/watcher among others. The real objective as we understand is to conserve the tiger and its forests. Enumeration/monitoring exercise is a key component in the objective and not the objective itself. The top management of tiger conservation need to be advised and be guided to adopt such methodologies which are most practical and effective and not be compelled to advocate/adopt methodologies merely because they profess to be based on science and technology and on quantitative techniques. Recent introductions appear to alienate these functionaries. Tools which have difficulty in acceptability and utility need to be replaced. Nothing can ever replace the base line information on movement of tigers by our watchers and guards. Aspect which requires consideration is factoring tigers' biology, especially its habit of territoriality and individual streaks, into any methodology under considerations.

6 SUGGESTIONS FOR TIGERS' CONSERVATION IN INDIA

Basing on findings arrived during the course of this research, the following suggestions are being proposed for management of tigers' conservation in India. The suggestions are being proposed for implementation in the immediate, in the short term, in the medium term and in the long term:

6.1 Immediate

- 6.1.1 Legal arrangements.** The issue of tiger conservation has been inextricably linked to the space being provided in most of the cases. With the burgeoning growth of human populations all around the country, and this included the habitations inside the tiger areas also. The extreme pressures which tigers started experiencing only led to more conflicts with interests of humans with the result that either much areas started getting devoid of tigers or tiger areas were encroached upon by humans. Boundaries of protected areas and tiger reserves were no longer sacrosanct, as illegal encroachments were acted upon and cases lodged before courts. However decisions by the courts were after long gaps. Further there have been cases of denotification of tiger reserves whereby boundaries were realigned. It is important critical tiger areas are made inviolate by taking recourse to legislations. Further attempt needs to provide larger areas for tigers to survive. There is an immediate **need to provide statutory cover to tiger landscapes and tiger corridors.**
- 6.1.2 Expanding economic activities & Impact of developmental initiatives.** The country is experiencing rapid economic growth. There is an **urgent need to factor the tiger areas while undertaking developmental projects.** It needs to be understood that it is not only the tiger which survives but the whole ecosystem and with it natural resources like water, fodder, biodiversity, air, etc.
- 6.1.3 Coordination.** Tiger habitats exist in environments of thousands of indigenous communities which depend on them (Daniel, 2001). Therefore we cannot view these forests in isolation from the surrounding socio-economic realities and

developmental priorities of the Govt. This calls for a cross-sectoral and cross-disciplinary approach. Tiger habitats are interface of various government and non government agencies in functioning including line departments. There is a pressing need for **appropriate coordination between different agencies** to ensure priority of purpose is given to tiger conservation.

- 6.1.4 Regional NTCAs.** The number of tiger reserves in India has gone up from 9 to 39 at present. Keeping in view the requirement to provide policy inputs at a decentralized level it will be important for the National Tiger Conservation Authority to have 4 (four) offices at zonal levels viz. North (Delhi), South (Coimbatore), East (Guwahati) and West (Nagpur).
- 6.1.5 Improving communications and collaborations.** Adoption of an inclusive model at tiger conservation will be critical in tiger habitats in human-tiger interfaces. There is a need for **collaborative ventures where the nuances of beneficial fall outs of tiger conservation are clearly brought out** for the major stakeholders i.e. local communities. It will be important for synchronization of governmental and non-governmental efforts while reaching out, where capacities are added towards a larger mission of survival of the tiger and its landscapes.
- 6.1.6 Availability of resources.** Flow of **finances to the tiger reserve management needs to be streamlined** and delivered without any lags.

6.2 Short Term

- 6.2.1 Ecological Services.** Almost all tiger reserves are watersheds for major and minor streams and rivers. Without the reserves, water security will certainly be further compromised. The **ecological service being rendered by the reserves need to be quantified and factored** in schemes and ventures including conservation expenditures.
- 6.2.2 Decline in numbers and census.** There is extreme global concern at decreasing numbers of tigers. Attempt needs to be made for consolidating tiger habitats and removing detrimental factors to their survival. It is also important to make the tiger count exercise more participatory including involving local community and non-governmental organisations. The **institution of 'Observers' like being practiced by the Election Commission of India could be used in tiger counts**, where wildlife experts and enthusiasts could be requested to oversee the census work. Such initiatives will help remove misgivings in the press and media about tiger numbers.
- 6.2.3 Increasing human populations and voluntary relocations.** Recourse for undertaking voluntary relocations need to be undertaken. Relocations of all families from inside core areas of tiger reserves need to be under taken during the current plan period. **Villagers who are willing to move out may be provided with market prices for their land and need to be facilitated with access services like education, health care, transport, housing, skill development, etc.** Robust alternatives on good practices need to be offered to relocatees.
- 6.2.4 Inappropriate interventions.** Forest authorities have attempted repopulating tiger-devoid forest areas by translocation of tigers from other forests. Such instances have been put to practice in the recent past in the reserves where tigers disappeared viz. Sariska and Panna. Though in the short term such efforts may be able to address of the nation and global community, yet what will be important that such practice is not generalized and all efforts for in-situ conservation and habitat protection is given its due priority.

- 6.2.5 Immunity from prosecution.** There have been instances where due to actions like firing, detentions, etc. by forest personnel while in protection of wildlife criminal cases have been instituted against them under the relevant criminal laws in India. This is resulting in lowering the morale of the staff and leading to adverse impact on efforts at wildlife conservation. **Forest personnel are required to be provided immunity from any action under the criminal laws** if acts by them are due to due diligence of office procedures.
- 6.2.6 No regulation over activities of private agencies.** Increasing concerns of civil society has ensured that wildlife conservation is taken up by agencies from the non-governmental sector. While this being a very welcome situation in making wildlife and tiger conservation participatory, it is raising the question of duplication of efforts. To ensure that efforts at tiger conservation achieve effective outcomes, it is important that an **umbrella entity guides such efforts** in a particular area. This will ensure better utilization of resources and efficient processes.
- 6.2.7 Buffers.** The strategy of »core-buffer« provides scope for ecodevelopment inputs. A small investment, based on site specific participatory planning in consultation with the people, complemented by sectoral integration of inputs in the larger surrounding landscape, is important to reduce the resource dependency through livelihood opportunities to such people. There is need for more wildlife inputs in managing the same.

6.3 Medium Term

- 6.3.1 Man animal conflict.** Lack of space for existing tigers has brought them into conflict with people. This has been exacerbated due to ever increasing human population and cattle populations all around. **Stall feeding of cattle, better cattle variety, ban on goats, adoption of appropriate agricultural practices** (like growing a strain of paddy which is not palatable to herbivores), etc. **needs to be immediately brought into practice.**
- 6.3.2 ‘Enclavisation’.** With rapid progress of human habitations, tiger areas have almost been surrounded by ocean of humanity. This has led to emergence of ‘enclaves’ where the wildlife including the tiger is hemmed in from all sides. Proper **planning is required to ascertain the carrying capacity of our forests and also the best sustainable use of our forests** so that interface areas are continued to be available for humans and wildlife.
- 6.3.3 Tourism – Economy of Scale or Community Driven?** Models where investments are low and which donot require major infrastructures inside natural habitats and where the major profits are earned by the immediate local communities need to be put in practice. Tourism is essential but **revenues from tourism activities in tiger reserves need to flow back directly into the management of each reserve so that local communities benefit** ensuring their support.
- 6.3.4 Public pressures & Awareness – Rural or Urban?** – India is large country where public opinion is variegated and diverse. It requires undertaking specific focus to **keep the public informed about the beneficial fallouts of wildlife conservation.** It is important with the **rural populace are covered in awareness programs** as they the majority in the interface areas with wildlife.
- 6.3.5 International Cooperation.** The international community through member states has attempted to combat such illegal activities by way of conventions, agreements, etc. Ramsar, CITES, Bonn, Geneva conventions etc. have played a major role in conservation of species. India has become signatory to such multilateral agreements

and also provided for domestic legislations like in the case of the National Biodiversity Act 2003. There is **need for more interactions in maintaining trans-border habitats and sharing of actionable intelligence.**

- 6.3.6 Decentralization of Tiger Reserve administration.** Administration of tiger areas is with the regional governments. The planning exercise is done at the regional level while financial support is both from federal and regional levels. The head of the tiger reserve i.e. Field Director exercises autonomy in tackling day to day issues yet they are hampered by untimely releases of funds, lack of manpower, etc. The tiger reserve administrative units could be **delegated with enhanced financial and administrative powers** so as to enable them to discharge their duties efficiently. This will also decentralize the administration process.

6.4 Long Term

- 6.4.1 Degradation of fringes and buffer.** Focus on the fringe areas of tiger habitats need to be made to arrest the decline in 'wilderness'. Loss of biodiversity including those of the prey presence in such fringe areas leads to more conflicts with the tiger. Recourse to the **involvement of local community in natural regeneration of forests is required** alongwith enhanced efforts at biodiversity conservation.
- 6.4.2 Biodiversity. Regular Assessments or Applications?** The government has sought to conserve bio resources by way of putting restrictions on their extraction. It appears appropriate if **regular monitoring could be carried out by designated agencies to ascertain the state of health of our major ecosystems.**
- 6.4.3 Land use.** Land adjacent to wildlife rich areas need to factor in appropriate developmental and economic activity practices. For example there have been efforts at growing lettuce in certain forest areas, and which it being extremely palatable to deer, has led to severe man-animal conflicts in Nuapada in Orissa. **Agricultural practices need to be environmentally friendly with use of eco-friendly alternatives to chemicals.**
- 6.4.4 Genetic diversity & Connectivity & Corridors.** It is important that in order to maintain genetic diversity and the concomitant genetic purity, the required number of individuals and the required sex ratio is maintained. There have been instances where due to depletion of individuals, local extinction of species have taken place like in Corbett for Wild Dogs and Sunabeda for Barasingha. Accordingly adequate space for wildlife movements is needed. In Africa the size of protected areas are to the tune of 10,000 sq kms or more which facilitates survival of large numbers of wildlife. While in the case of India, due to paucity of land, National Parks etc. are much smaller. Accordingly there is an immediate need for linkages or corridors between habitats. Such **corridors and connectivity need to be protected to facilitate movement of wildlife.**
- 6.4.5 Poaching and enforcement – Local Participation or Top Driven?** Poaching has become a major menace during the past few decades. The issue of involvement of local communities has shown good success in many areas. Such good practices need to be replicated, as it will afford income generating opportunities as well as make the process of conservation participatory. **Punishments in respect of wildlife crimes need to be exemplary. Powers to prosecute need to be given to Customs, Coast Guard, Border Security Force, etc.**
- 6.4.6 Local community.** In tiger areas where human-tiger interface exists, involvement of local community will be a critical factor in ensuring success in public policy. There is growing concern globally about deepening sense of alienation amongst the

local communities in the process of wildlife conservation. Various initiatives like Community Reserves, Conservation Reserves, Joint Forest Management, etc. have been taken where the local community is involved in public policy. Further currently there is a public debate on the issue of shares in a business venture, located in tribal and forest areas, being offered to local communities. This model could be considered in tourism ventures which are gradually catering to the tourism sector in wildlife and tiger areas. **Cooperation of the villagers located in the interiors needs to be sought and their involvement ensured as well for the cause of the tiger** (Bhujabal & Bhujabal, 2003, p. 98).

- 6.4.7 Research and science – In situ or Ex situ Conservation?** – Presently finance is being provided for undertaking both in-situ and ex-situ research activities. The world has not seen any successful introduction of a captive bred tiger into the wilds (Bhujabal & Bhujabal, 2000, p. 89). There is a **need for utility based research where focus is on conservation in natural habitats**.
- 6.4.8 Spillovers.** The issue of spill over of tiger populations in certain tiger reserves requires attention. In order to address this problem whereby tigers come into conflict with local human habitations necessary forest regeneration is needed in the fringe areas, corridors need to be provided etc. which will facilitate extra tigers to accommodate themselves in adjoining areas.
- 6.4.9 Political will and mainstreaming tiger and biodiversity conservation.** India has a rich tradition of conserving its wildlife. Over past many years such efforts have enabled the country to preserve its natural heritage. Democracy in India witnesses a multiparty system where people centric issues take centre stage. In such circumstances it becomes difficult for political parties to cater to the interests of wildlife. However the other institutions like the judiciary and press have been playing a major role facilitating mid-course corrections. Presently there is great deal of political will in the federal government. **Major political parties have featured wildlife conservation in their manifestos**. There is need to further this development.
- 6.4.10 Multidisciplinary Approach.** Efforts at **tiger conservation need to ensure that the issue of tiger conservation is mainstreamed in India**. At present there are a number of agencies in the governmental sector which address issues in tiger habitats. It will be important interventions being considered and implemented by such agencies are in sync with the ultimate objective of conservation of the tiger and its habitat.
- 6.4.11 Accountability.** The recently introduced tripartite Memorandum of Understanding (MOU) between the Ministry of Environment and Forests, State Governments and Tiger Reserve Management laying out the respective responsibilities and reciprocal commitments linked to fund flows to ensure effective tiger conservation in the country. This will bring in public accountability relating to tiger conservation by ensuring reciprocal commitments between the Centre, the tiger States and the Field Director of Tiger Reserves thereby ensuring effective tiger conservation. Tiger conservation which is a shared responsibility between the Central and State Governments. It will be important that **independent auditors and experts are engaged in review of the progress** each case at periodical intervals.

CONCLUSION

Today, confined to less than 7% of their original range, tigers are going through one of the worst crises in their evolutionary history. The Indian subcontinent, which contains most of the world's wild tigers, represents only 11% of the world's tiger habitat. It is estimated that there may be less than 1,600 tigers in the whole of the Indian subcontinent and the realistic maximum number of tigers that could be supported with its current habitat would be around 3,700. Tiger conservation in the Indian subcontinent faces a range of serious and complex threats, but most of these issues are still possible to address.

The level of expenditure on tiger conservation needs to be considered with the ecological services accruing from conservation and protection of such forests, rather than only focusing on tiger numbers benefiting. Keeping in view the priority need to carry out voluntary relocations of human habitations enhanced outlay needs to be provided during the coming plan periods. There is a need for enhancing central assistance for providing extra protection measures in tiger reserves by way of recruiting local youth. The outlay provided for conservation of tigers in India need to be seen in the perspective of outlays for other sectors, which shows it is an extremely small component of budgetary exercise. It will also be appropriate if revenues generated by way of tourism and other services rendered are channeled back for management of the reserves. Here it is important in view of strategic nature of economy, expenditures are restricted only to that amount which is absolutely necessary.

Tiger conservation management could attain better efficiency which can be achieved by way of appropriate decentralization in functioning of tiger reserve administrative units, empowering local community, etc. Certain expenditures towards local community, viz. providing them with patrolling aids and communication systems, could yield much beneficial fall outs. Expenditures on plantations in past years even in eco-rich natural areas appear not justifiable as they did not yield results and further resulted in monocultures. Emphasis has changed for the government in India for natural regeneration of forests. It has been seen that in comparison to expenditures to raising plantations, expenses on the practice of natural regenerations of forests are much smaller. Since conservation of wildlife including tigers requires conservation of natural habitats, this policy shift could assist in achieving public policy objectives in tiger conservation.

Equitable benefits to all stakeholders have been an evolving phenomenon in the case of wildlife and tiger conservation in India. It is to be emphasized that the tiger remains the major stakeholder. However as has been experienced, interests of the local community have become more and more important. The lack of local support for conservation is compounded by persistent local support to threats such as poaching and creates one of the most serious problems to the long-term future of tigers, and indeed, all wildlife in the subcontinent. Although, to a certain extent, the lack of local support may be a response to resource-use restrictions imposed by conservation managers, there are deeper ethical issues requiring more attention. A lot of scope remains in achieving further benefits for local communities. Practice of community management of forests, community management of services including tourism, access to natural resources in forest areas, remunerative income generation activities like forest protection and guiding, etc. could go a long way in ensuring a more equitable outcome. This however needs to be carefully weighed against over-exploitation of natural resources.

Can we consider incentivizing conservation? Perhaps yes if we could involve the local communities residing on the fringe areas. There have been some sporadic efforts by certain non-governmental organisations in this regard which could be considered to be replicated. Involving local people in forest management activities and making them a part of the revenue generating activities could be good incentives. Further another approach could be to dovetail the existing social welfare programs of the government for the welfare of the forests fringe communities. Carbon credits could be utilized as another incentive, though contradictions on facilitating credits in promoting regeneration of forests and credits due from plantations need to be sorted out.

Although the subcontinent (India in particular) boasts some of the strongest wildlife legislation anywhere, the local contexts also illustrate how extremely difficult it is to implement them everywhere or all the time. For example, although all livestock grazing is prohibited within India's national parks, in reality the need for grazing land is so great, often among the poorest sections of society, that this law has been unenforceable and, therefore, utterly useless in curtailing pressures of livestock grazing on wildlife habitats. There is therefore serious need to revise laws such that they are reasonable, just and fair, and hence truly implementable. Poor and whimsical implementation have provoked a serious legislative backlash such as the recent Indian Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, which could place many important wildlife habitats in serious jeopardy. The need for increasing inviolate spaces for the tiger and also consolidating tiger landscapes need to engage the policy makers and the government.

The practice of conservation of tigers in India has shown mixed results. In view of the governance set-up of India, including its democracy and constitution & federal set up, and also in view of the fact 'Wildlife and Forests' fall under the Concurrent List, the issue of conservation of wildlife including tigers need careful review from time to time. Environment and wildlife need to continue to be regarded as public goods. Experience has shown that managing public property in India with competing demands from many sectors is a difficult task. Decentralization could play a major role in increasing effectiveness. At present there is a very small economic decentralization in place, mostly by way of levying and collection of certain user fees like renting of rest houses, elephant rides, treks, camping, etc. There is a medium level of political decentralization between the federal and regional governments. Also similar situation exists in the case of administrative decentralization. Such decentralization could be worked upon further in attempting decentralization for the administrative units for tiger reserves.

In spite of these burgeoning problems, some notable progress has been accomplished. The National Tiger Conservation Authority and Wildlife Crime Control Bureau have been established. New tiger reserves are being set up. Alternative solutions are being put to practice in attempting to mitigate man-animal conflicts. Efforts in the Indian Sundarbans are a case in point where villagers are being encouraged to pursue apiaries to gather honey instead of going into the forest. This and similar efforts will ensure a reduced level of tiger – human conflicts – yielding dividends in the form of undisturbed tiger habitats and higher densities of prey and tiger – without compromising human goals.

The policy on wildlife conservation needs to be made more accountable. Such accountability could be measured in respect of maintaining biodiversity and species

conservation. In respect of tiger reserves there has been a great deal of success on the maintenance of forest cover. But the same cannot be said for tiger numbers. As has been elaborated in the preceding paragraphs the causative factors need to be addressed to ensure their increase in numbers. The newly introduced revised memorandum of understanding between the federal government, state government and the tiger reserve administration needs to be carefully monitored.

The policy and practice of management of tigers' conservation in India needs to be made inclusive and evidence based which will ensure effectiveness. There is a need for synergizing efforts from various quarters and adopting a multi-sectoral approach for enabling economy and equity. It will be important to introduce sustainable practices in buffer areas outside inviolate areas earmarked for tiger conservation. The need of the hour is to incentivize population controls in humans so as to ensure that usufruct benefits are shared on a sustainable basis in the long term. Involving local communities inside and in the fringes of tiger forests in management activities like protection and public services could gain stakeholders support for policy implementation. Ecological services which accrue from conservation of wildlife and wildlife habitats need to be evaluated and suitably factored in all interventions and programs. Consolidation of tiger forest areas by providing adequate legal cover, including those by facilitating voluntary relocations, and bringing in corridors and habitat connectivity under legal status will help in ensuring proper and effective policy implementation.

The challenges to conserving the tiger in the Indian subcontinent are many, but so are the opportunities. More challenges lie ahead for the tiger, but the nation has the resolve to rise and secure the future of this big cat. Since times immemorial the tiger has raised strong emotions around the globe and it is expected that this emotional chord will ensure its long term survival.

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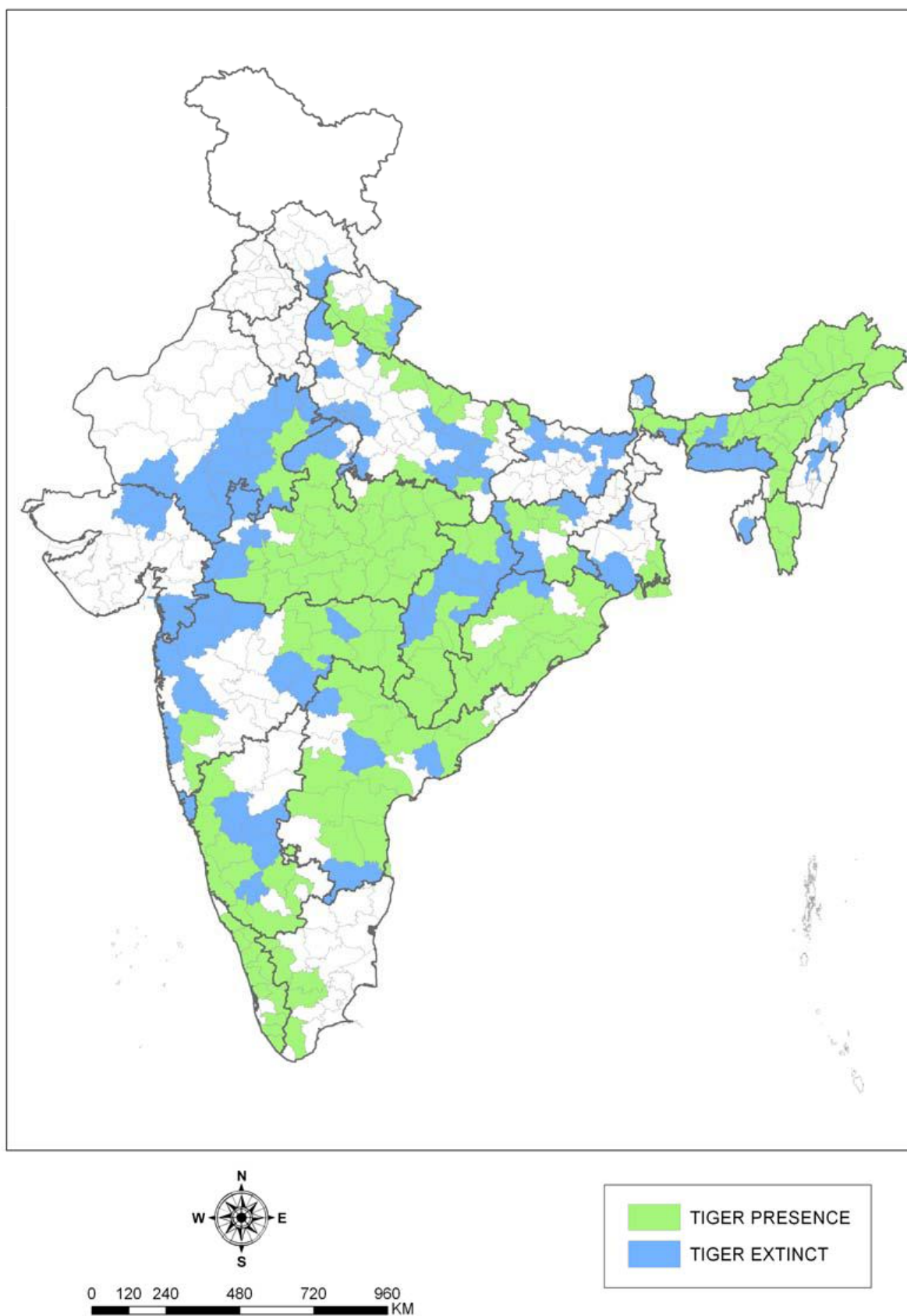
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APPENDICES

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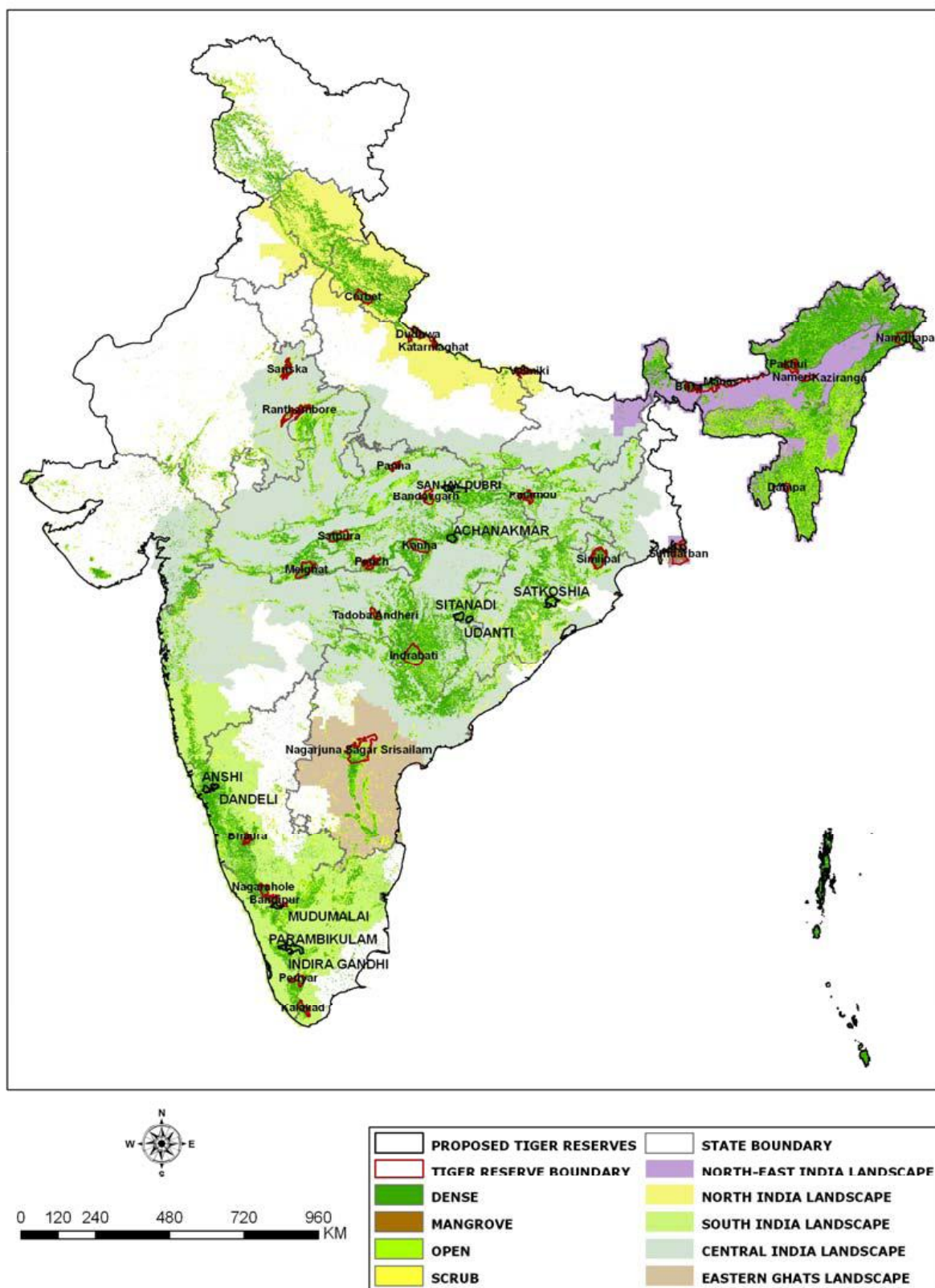
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Appendix 1: Distribution of tigers in India



Source: Y. V. Jhala, R. Gopal and Q. Quershi, *Status of Tigers, Co-predators and Prey in India*, 2008.

Appendix 2: Tiger reserves in India



Source: Y. V. Jhala, R. Gopal and Q. Quershi, *Status of Tigers, Co-predators and Prey in India*, 2008.

Appendix 3: Population of tigers in India during 1997 & 2001–2002

| No. | Name of the state | 1997 | 2001–2002 |
|-----|-------------------|--------------|--------------|
| 1 | ANDHRA PRADESH | 171 | 192 |
| 2 | ARUNACHAL PRADESH | * | 61** |
| 3 | ASSAM | 458 | 354 |
| 4 | BIHAR | 103 | 76 |
| 5 | CHHATTISGARH | *** | 227 |
| 6 | DELHI | NIL | NIL |
| 7 | GOA | 6 | 5 |
| 8 | GUJARAT | 1 | NIL |
| 9 | HARYANA | NIL | NIL |
| 10 | HIMACHAL PRADESH | NIL | NIL |
| 11 | JAMMU & KASHMIR | NIL | NIL |
| 12 | JHARKHAND | *** | 34 |
| 13 | KARNATAKA | 350 | 401 |
| 14 | KERALA | 73 | 71 |
| 15 | MADHYA PRADESH | 927 | 710 |
| 16 | MAHARASHTRA | 257 | 238 |
| 17 | MANIPUR | * | NIL |
| 18 | MEGHALAYA | * | 47 |
| 19 | MIZORAM | 12 | 28 |
| 20 | NAGALAND | * | 23^ |
| 21 | ORISSA | 194 | 173 |
| 22 | PUNJAB | NIL | NIL |
| 23 | RAJASTHAN | 58 | 58 |
| 24 | SIKKIM | * | NR |
| 25 | TAMIL NADU | 62 | 60 |
| 26 | TRIPURA | * | NR |
| 27 | UTTARANCHAL | *** | 251 |
| 28 | UTTAR PRADESH | 475 | 284 |
| 29 | WEST BENGAL | 361 | 349 |
| | Total | 3,508 | 3,642 |

Legend:

N.R. Not reported by State.

* Tiger census was not carried out.

** Only for Namdapha Tiger Reserve.

*** Figures included in undivided State.

^ Entire state not covered.

Source: Lok Sabha, Reply to Parliament Question. Lok Sabha starred question no. 256 on tiger population reply on 11.08.2010, 2010.

Appendix 4: Population of tigers in India during 2008

| State | Tiger km ² | Tiger Numbers | | |
|--|-----------------------|---------------|-------------|-------------|
| | | No. | Lower limit | Upper limit |
| Shivalik-Gangetic Plain Landscape Complex | | | | |
| Uttarakhand | 1,901 | 178 | 161 | 195 |
| Uttar Pradesh | 2,766 | 109 | 91 | 127 |
| Bihar | 510 | 10 | 7 | 13 |
| Shivalik-Gangetic | 5,177 | 297 | 259 | 335 |
| Central Indian Landscape Complex and Eastern Ghats Landscape Complex | | | | |
| Andhra Pradesh | 14,126 | 95 | 84 | 107 |
| Chattisgarh | 3,609 | 26 | 23 | 28 |
| Madhya Pradesh | 15,614 | 300 | 236 | 364 |
| Maharashtra | 4,273 | 103 | 76 | 131 |
| Orissa | 9,144 | 45 | 37 | 53 |
| Rajasthan | 356 | 32 | 30 | 35 |
| Jharkhand** | 1,488 | Not Assessed | | |
| Central Indian | 48,610 | 601 | 486 | 718 |
| Western Ghats Landscape Complex | | | | |
| Karnataka | 18,715 | 290 | 241 | 339 |
| Kerala | 6,168 | 46 | 39 | 53 |
| Tamil Nadu | 9,211 | 76 | 56 | 95 |
| Western Ghats | 34,094 | 412 | 336 | 487 |
| North East Hills and Brahmaputra Flood Plains | | | | |
| Assam* | 1,164 | 70 | 60 | 80 |
| Arunachal Pradesh* | 1,685 | 14 | 12 | 18 |
| Mizoram* | 785 | 6 | 4 | 8 |
| Northern West Bengal* | 596 | 10 | 8 | 12 |
| North East Hills, and Brahmaputra | 4,230 | 100 | 84 | 118 |
| Sunderbans | 1,586 | Not Assessed | | |
| Total Tiger Population | | 1,411 | 1,165 | 1,657 |

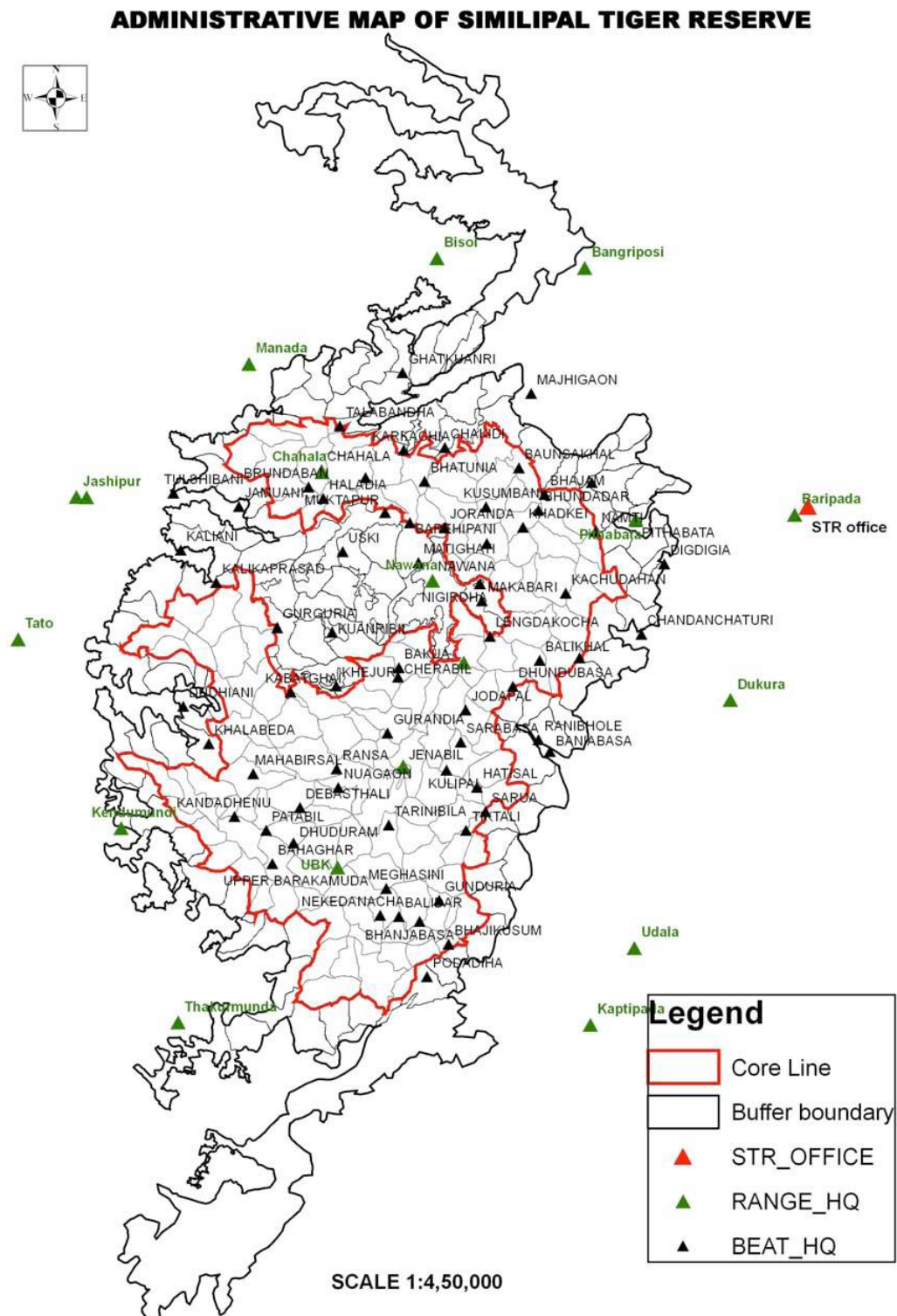
Legend:

Population estimates are based on possible density of tiger occupied landscape in the area, not assessed by double sampling.

** Data was not amenable to population estimation of tiger.

Source: Lok Sabha, Reply to Parliament Question; Lok Sabha starred question no. 256 on tiger population reply on 11.08.2010, 2010.

Appendix 5: Administrative map of Similipal Tiger Reserve



Source: Pandav et al., Similipal tiger reserve – a rapid field assessment of conservation status, 2009.

Appendix 6: List of endangered birds in Similipal Tiger Reserve

Critically Endangered

Oriental White-backed Vulture *Gyps bengalensis*

Long-billed Vulture *Gyps indicus*

Vulnerable

Greater Spotted Eagle *Aquila clanga*

Purple Wood-Pigeon *Columba punicea*

Green Munia *Amandava formosa*

Biome 10: Indian Peninsula Tropical Moist Forest

Small Green-billed Malkoha *Phaenicophaeus viridirostris*

Malabar Trogon *Harpactes fasciatus*

Malabar Pied Hornbill *Anthraceroceros coronatus*

Indian Scimitar-Babbler *Pomatorhinus horsfieldii*

Malabar Whistling-Thrush *Myiophonus horsfieldii*

Biome 12: Indo-Malayan Tropical Dry Zone

Loten's Sunbird *Nectarinia lotenia*

Red-headed Vulture *Sarcogyps calvus*

White-eyed Buzzard *Butastur teesa*

Red-headed Falcon *Falco chicquera*

Rain Quail *Coturnix coromandelica*

Jungle Bush-Quail *Perdica asiatica*

Painted Bush-Quail *Perdica erythrorhynchos*

Painted Spurfowl *Galloperdix lunulata*

Indian Peafowl *Pavo cristatus*

Yellow-wattled Lapwing *Vanellus malabaricus*

Yellow-legged Green-Pigeon *Treron phoenicoptera*

Plum-headed Parakeet *Psittacula cyanocephala*

Sirkeer Malkoha *Phaenicophaeus leschenaultii*

Common Indian Nightjar *Caprimulgus asiaticus*

Indian Grey Hornbill *Ocyroceros birostris*

Brown-headed Barbet *Megalaima zeylanica*

Lineated Barbet *Megalaima lineata*

Yellow-fronted Pied Woodpecker *Dendrocopos mahrattensis*

Lesser Golden-backed Woodpecker *Dinopium benghalensis*

Red-winged Bush-Lark *Mirafra erythroptera*

Bengal Bush-Lark *Mirafra assamica*

Ashy-crowned Sparrow-Lark *Eremopterix grisea*

Black-headed Cuckoo-Shrike *Coracina melanoptera*

Small Minivet *Pericrocotus cinnamomeus*

Common Woodshrike *Tephrodornis pondicerianus*

White-browed Bulbul *Pycnonotus luteolus*

Indian Robin *Saxicoloides fulicata*

Rufous-bellied Babbler *Dumetia hyperythra*

Jungle Babbler *Turdoides striatus*

Ashy Prinia *Prinia socialis*

Grey-headed Starling *Sturnus malabaricus*

Brahminy Starling *Sturnus pagodarum*

Bank Myna *Acridotheres ginginianus*

White-bellied Drongo *Dicrurus caerulescens*

Source: Z. U. M. Islam and A. R. Rahmani, *Important Bird Areas in India: Priority Sites for Conservation*, 2003.

Appendix 7: Number of villages in tiger reserves

| No. | Name of State | Name of Tiger Reserve | No. of Villages in Core/Critical Tiger Habitat | No. of families in villages falling in core/critical areas |
|-----|-------------------|-----------------------|--|--|
| (1) | (2) | (3) | (4) | (5) |
| 1 | Assam | Manas | 32 | 912 |
| 2 | Assam | Kaziranga | Nil | Nil |
| 3 | Assam | Nameri | Nil | Nil |
| 4 | Andhra Pradesh | Nagarjunasagar | 27 | 102 |
| 5 | Arunachal Pradesh | Namdapha | 8 | 84 |
| 6 | Arunachal Pradesh | Pakke | Nil | Nil |
| 7 | Bihar | Valmiki | Nil | Nil |
| 8 | Chattisgarh | Indravati | 56 | 993 |
| 9 | Chattisgarh | Udanti-Sitanadi | 45 | 3,138 |
| 10 | Chattisgarh | Achanakmar | 25 | 1,774 |
| 11 | Jharkhand | Palamau | 3 | 105 |
| 12 | Kerala | Periyar | 1 (enclave in the core) | 100 |
| 13 | Kerala | Parambikulam | 6 | 299 |
| 14 | Karnataka | Bandipur | Nil | Nil |
| 15 | Karnataka | Bhadra | 4 | 81 |
| 16 | Karnataka | Dandeli-Anshi | 52 | 4,725 |
| 17 | Karnataka | Nagarhole | 45 | 1,353 |
| 18 | Maharashtra | Tadoba-Andhari | 5 | 924 |
| 19 | Maharashtra | Pench | 1 | 85 |
| 20 | Maharashtra | Melghat | 31 | 5,835 |
| 21 | Madhya Pradesh | Bandhavgarh | 14 | 2,164 |
| 22 | Madhya Pradesh | Kanha | 26 | 1,828 |
| 23 | Madhya Pradesh | Bori-Satpura | 41 | 2,693 |
| 24 | M.P. | Panna | 5 | 2,811 |
| 25 | M.P. | Sanjay Tiger Reserve | 47 | 3,256 |
| 26 | M.P. | Pench | Nil | Nil |
| 27 | Mizoram | Dampa | 1 | 224 |
| 28 | Orissa | Satkosia | 5 | 77 |
| 29 | Orissa | Simlipal | 6 | 221 |
| 30 | Rajasthan | Ranthambhore | 55 | 6,124 |
| 31 | Rajasthan | Sariska | 28 | 2,254 |

| | | | | |
|---------------|-------------|----------------------|------------|---------------|
| 32 | Tamil Nadu | Kalakad-Mundanthurai | 8 | 245 |
| 33 | Tamil Nadu | Mudumalai | 30 | 449 |
| 34 | Tamil Nadu | Anamalai | 33 | 94 |
| 35 | Uttarakhand | Corbett | 2 | 71 |
| 36 | U.P. | Dudhwa | 18 | 1,475 |
| 37 | West Bengal | Buxa | 19 | 1,744 |
| 38 | West Bengal | Sundarbans | Nil | - |
| 39 | Maharashtra | Shyadri | 83 | 2,309 |
| Total: | | | 762 | 48,549 |

Source: Lok Sabha, Lok Sabha starred question no. 49 on relocation of villagers reply on 28.07.2010, 2010.

Appendix 8: Expenditures in tiger reserves (Rs in lakhs)

| No. | States | Release 2006–2007 | Utilised 2006–2007 | Release 2007–2008 | Utilised 2007–2008 | Release 2008–2009 | Utilised 2008–2009 | Release 2009–2010 |
|-----|-------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| 1 | Andhra Pradesh | 46.675 | 35.000 | 73.9175 | 50.0005 | 56.9830 | 80.8100 | 94.9100 |
| 2 | Arunachal Pradesh | 237.3725 | 212.690 | 110.2542 | 110.0347 | 246.1710 | 54.7800 | 48.8600 |
| 3 | Assam | 87.431 | 65.000 | 95.6140 | 66.8830 | 1092.3790 | 210.0000 | 184.7700 |
| 4 | Bihar | 69.9554 | 73.850 | 98.3205 | 47.9936 | 49.6730 | 0.0000 | 8.0000 |
| 5 | Chhattisgarh | 10.00 | 12.820 | 35.2250 | 32.3547 | 169.8700 | 131.4300 | 1338.70 |
| 6 | Jharkhand | 286.277 | 373.872 | 45.1600 | 18.3765 | 115.3770 | 112.9000 | 110.7350 |
| 7 | Karnataka | 109.00 | 135.760 | 1159.7149 | 1126.8433 | 689.8390 | 640.9900 | 644.9720 |
| 8 | Kerala | 155.967 | 103.872 | 153.2449 | 134.8449 | 267.0900 | 257.2900 | 281.1600 |
| 9 | Madhya Pradesh | 897.942 | 701.729 | 2975.9411 | 2878.0761 | 6998.5420 | 5339.1600 | 1384.4460 |
| 10 | Maharashtra | 238.56 | 242.650 | 295.7191 | 253.8468 | 411.1250 | 391.2200 | 362.8770 |
| 11 | Mizoram | 115.16 | 77.974 | 82.9000 | 82.9000 | 241.4500 | 241.4500 | 128.0000 |
| 12 | Orissa | 183.8717 | 139.185 | 43.2800 | 42.0400 | 625.9900 | 422.7300 | 170.0800 |
| 13 | Rajasthan | 176.541 | 194.005 | 410.6800 | 325.9826 | 2708.9500 | 1092.2800 | 10694.1700 |
| 14 | Tamil Nadu | 108.535 | 79.428 | 45.0000 | 44.2360 | 690.8060 | 431.2600 | 240.55 |
| 15 | Uttaranchal | 192.78 | 201.660 | 202.0050 | 188.5550 | 462.8500 | 358.9600 | 241.7050 |
| 16 | U.P | 183.265 | 101.770 | 134.8900 | 260.2435 | 417.5130 | 243.9700 | 298.5500 |
| 17 | West Bengal | 190.5283 | 226.920 | 308.6741 | 117.4000 | 228.3940 | 231.5300 | 414.4370 |
| | Total | 3,289.8609 | 2,978.185 | 6,270.5403 | 5,780.6112 | 15,473.002 | 10,240.7600 | 16,646.9260 |

Source: Rajya Sabha, Reply on 14th December 2009, Parliament of India, 2009b.