Environmental Assessment and Review Framework

June 2013

India: Karnataka Integrated and Sustainable Water Resources Management Investment Program

Prepared by Karnataka Neeravari Nigam Limited for the Asian Development Bank.

CURRENCY EQUIVALENTS
(as of 1 May 2013)

Currency unit	–	Indian rupee/s (Re/Rs)
Re1.00	=	$0.01864
$1.00	=	Rs53.65

ABBREVIATIONS

AC-IWRM	Advanced Centre - Integrated Water Resource Management
ADB	Asian Development Bank
AEE	Assistant Executive Engineer
CADA	Command Area Development Authority
CE	Chief Engineer
CPCB	Central Pollution Control Board
DoEF	Department of Environment and Forests, Government of Karnataka
EARF	Environmental Assessment and Review Framework
EE	Executive Engineer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA, 1986	Environmental Protection Act, 1986
GoI	Government of India
GoK	Government of Karnataka
ha	Hectares
HWHAMA	Hampi World Heritage Area Management Authority
IEE	Initial Environmental Evaluation
IWRM	Integrated Water Resources Management
KISWRMIP	Karnataka Integrated and Sustainable Water Resources Management Investment Program
KSPCB	Karnataka State Pollution Control Board
MAB	Man and Biosphere
MFF	Multitranche Financing Facility
MoEF	Ministry of Environment and Forests, India
MW	Megawatts
NABET	National Accreditation Board of Education and Training
O&M	Operation and Management
PMU	Project Management Unit
RSPM	Respiratable Suspended Particulate Matter
SE	Superintending Engineer
TA	Technical Assistance
QCI	Quality Council of India
UNESCO	United Nations Educational, Scientific and Cultural Organisation

NOTE

(i) In this report, "$" refers to US dollars.

I. INTRODUCTION

1. The State Government of Karnataka (SGOK) has requested financing from the Asian Development Bank (ADB) to enhance water security in selected basins where there is increasing water stress due to rapid economic growth and future competing needs for water supply and industry. The Government of India, SGOK and ADB agreed to prepare the Karnataka Integrated and Sustainable Water Resources Management Investment Program (KISWRMIP). This is to be financed through a Multi-tranche Financing Facility (MFF) to enable flexibility in investment decisions and timing based on the needs and constraints of the project, instead of a precise definition of investments up front as conventionally required.

2. The Environmental Assessment and Review Framework (EARF) which is required by the ADB SPS June 2009 is to guide subproject selection, screening and categorization, environmental assessment, and preparation and implementation of safeguard plans of subprojects to facilitate compliance with the ADB requirements. As a part of this EARF, potential environmental impacts and a general environmental management plan has also been developed and this will help guide the environmental process in the subsequent tranches of the MFF. The impacts and EMP presented in this EARF are only for guidance, and site specific assessments should be done for each subproject.

3. The EARF is intended for use and reference primarily by the Program's key stakeholders and particularly the Program Management Unit (PMU) which will be located within the Karnataka Neeravari Nigam Limited (KNNL), Program Implementation Offices (PIO) and Water User Cooperative Societies (WUCS). The framework will be translated into Kannada language and disseminated accordingly. The English version will be posted on the ADB website.

A. Project Overview

4. The SGOK, Government of India (GOI) and ADB have agreed on technical assistance for preparing the Karnataka Integrated and Sustainable Water Resources Management Investment Program (KISWRMIP).

5. Program Impact: The impact of the Program will be enhanced availability of water resources in selected Karnataka river basins. Indicator targets from the Design and Monitoring Framework (DMF) for this are, by 2025:

(i) River basin management and strategies established in selected sub-basins
(ii) Water sector projected demands for various water users are met in accordance with state vision
(iii) State gross value (2012 INR) of annual agricultural production increases from INR 62,057 ,crore (USD 11.28b) to INR 117,634 crore (USD 21.39b)

6. Program Outcome: The Outcome of the Program would be improved integrated water resources management in the selected river basins in Karnataka. The indicator targets for this are:

(i) By 2020 the State IWRM strategy will be under implementation
(ii) By 2020 annual water resources monitoring and assessments in program sub-basins and corresponding water allocations to users are being implemented
(iii) By 2020 Infrastructure and management systems on selected irrigation subprojects is modernized (FAO 1996) within selected sub-basins

7. Program Outputs: The KISWRMIP comprises 3 Program Level Outputs, each with performance indicators, and these are:

(i) State and basin institutions strengthened for IWRM
(ii) Irrigation system infrastructure and management modernized
(iii) Program management systems operational

8. The KISWRMIP will be financed through a Multi-tranche Financing Facility (MFF) to enable flexibility in investment decisions and timing based on the needs and constraints of the project. The MFF will allow ADB and GOK to develop a long-term partnership for supporting the goals of the KISWRMIP in a realistic timeframe. Procurement would be carried out according to the ADB's Procurement Guidelines.

9. As indicated above the proposed program has three major Outputs which will support GOK agencies:

1. State and basin institutions strengthened for IWRM

10. The overarching IWRM component would provide continuous support and introduce international leading practice to the GOK through the Advanced Centre – IWRM (AC-IWRM) in building IWRM approaches suited to Karnataka. It would support the Centre in becoming an international centre of excellence. This component would (i) undertake IWRM policy studies and prepare a State IWRM Strategy, (ii) develop and utilize a Water Information Knowledge Management system, (iii) prepare and implement a State wide inventory of river basins capacity building and human resource development, (iv) support river basin planning and recommend river basin organization arrangements initially for the Tungabhadra sub-basin, (v) trial community based Land and Water Management Plans including local environmental sustainability issues such as water quality and waste management, water table and groundwater control, biodiversity conservation; (vi) assess water use efficiency and water productivity at scales from river basin to irrigation system and field levels, (vii) raise stakeholder awareness and participation, (viii) develop partnerships with international organizations and governments responsible for the management of severe water scarcity in river basins and with an interstate water sharing context. This will be supported by IWRM capacity building and training, and, investigations of approaches internationally, regionally and nationally.

2. Irrigation system infrastructure and management modernized

11. This component would improve irrigation service delivery and sustainability using an IWRM approach. This would include integrated planning and management for selected command areas and involve: (i) achieving a sustainable water balance; (ii) infrastructure modernization for Bhadra and Gondi for tranche 1 and throughout the Tungabhadra River sub basin in subsequent tranches, specifically Vijaynagara and Tungabhadra left bank canal (TLBC) irrigation subprojects. It would include flow measurement, telemetry and related control systems; canal rehabilitation and lining; and command areas development; (iii) agriculture development including raising water use efficiency and water productivity and improving the environmental functioning of irrigation (e.g. use of Integrated Pest Management (IPM), soil health, use of agrochemicals); (iv) improving farmer livelihoods and living conditions; (v) management of water logging, salinity and return flows and their quality, and, (vi) institutional and human strengthening including for KNNL and other Nigams (irrigation corporations of the Water Resources Department [WRD]), Command Area Development Authorities (CADA), Water User Cooperative Societies (WUCS) and farmers via extension services to promote necessary changes.

12. This output would improve irrigation service delivery and sustainability using an IWRM approach. This would include integrated planning and management for selected command areas and involve:

(i) Developing an improved understanding of water availability and usage within the Tungabhadra sub-basin through provision of a flow measurement network and associated information system
(ii) Supporting improved operation of selected irrigation subprojects to provide more equitable distribution and reduced wastage
(iii) Modernization of the selected canal systems and command areas to improve water use efficiency and equity (Gondi in Tranche 1, Vijayanagara and Tungabhadra left bank canal in Tranche 2,)
(iv) Capacity building of system operations staff, water user organizations and agricultural staff to support the objective of increased crop value concurrent with reduced water consumption.

3. Program management systems operational

13. This output concerns the overall management of the program including the direct oversight of the implementation of Output 2. KNNL is proposed as the program Executing Agency. The SGOK IWRM Steering Committee, chaired by the Chief Secretary, will be responsible for overall review of the program and to facilitate inter-departmental coordination, especially for IWRM activities. The Implementing Agency for Output 1 will be the AC-IWRM; Output 2, KNNL; and, for Output 3, the KNNL through its Irrigation Zones (Field Units) and the concerned CADAs.

14. A Program Management Unit (PMU) is established in KNNL, under the Managing Director KNNL, who is designated as the Program Director. The PMU will have overall responsibility for Output 3. The PMU will be responsible for overall program management, coordination, monitoring and reporting. Communications will be managed consistent with GOI and ADB requirements for transparency. The PMU will be supported by a Program Support Consultancy (PSC) team in its work. The PSC will comprise international and domestic specialists in the areas of irrigation management, irrigation operation, water institutions, PIM, agriculture, social, gender and the environment.

15. The program will be monitored according to the Program Design and Monitoring Framework and a Program monitoring information systems (MIS) database will be established in the commencement phase of the project. Program coordination at headquarters (in Bangalore) will be the responsibility of the Program Director (PD). For interagency coordination, the Program Director will have the support of the KNNL / WRD, the AC-IWRM and state IWRM and program Steering Committees.

16. Transparent and effective external relations and disclosure of information will be undertaken consistent with the ADB, Public Communications Policy 2011 and the Government of India, Right to Information Act, 2005. The PMU will establish a specific communication strategy consistent with these policies.

a. The EARF

17. This EARF covers investments under Output 2, Irrigation system infrastructure and management modernized. The preliminary investment roadmap comprises a range of projects as follows:

(i) Provision of a flow measurement and information system for the entire Tungabhadra (or K-8) sub-basin of the Krishna basin (Tranche 1)
(ii) Modernization of Gondi irrigation subproject including main and distribution systems (Tranche 1)
(iii) Modernization of Vijaynagara (VNC) and part of the TLBC irrigation subprojects and the respective command areas (Tranche 2)
(iv) Training of Irrigation Water Supply Service Providers in Organization and System Management (all tranches)
(v) Capacity building of WUCS in land and water management and irrigated agriculture to increase crop production (all tranches)

II. ASSESSMENT OF LEGAL FRAMEWORK

18. There are a number of acts and rules of the State and National Government that may be of importance to the project. While some of these could define activities to be done and location of the project, there are others that may be supported by project activities. This section discusses these regulations and their implications.

B. National and State Legislation

1. Environmental (Protection) Act, 1986, Environmental Impact Assessment Notification, 2006 with amendments and rules

19. This act vests power to the Central Government to take necessary action to protect the environment and prevent environmental pollution. Under this act standards for discharge of effluents and pollution standards, as specified under the various pollution control acts are made. Under this act procedures and safeguard for handling of hazardous substances are also laid down. All projects and activities are broadly categorized in to two - Category A and Category B, based on the spatial extent of potential impacts and potential impacts on human health and natural and man made resources. Clearances for category A projects are from the central government and processed through the Ministry of Environment and Forests. Category B projects require clearance at the state level and will go through the State Environment Impact Assessment Authority (SEIAA).

20. According to notification of 2006 under sub-rule (3) of rule 5 of the EPA, 1986, powers conferred by sub-section (1) and clause (v) of sub-section (2) of section 3 of the Environment (Protection) Act, 1986, read with clause (d) of sub-rule (3) of rule 5 of the Environment (Protection) Rules, 1986 construction of new projects or activities or the expansion or modernization of existing projects or activities listed in the Schedule to the notification entailing capacity addition with change in process and or technology will only be undertaken after the prior environmental clearance from the Central Government or as the case may be, by the State Level Environment Impact Assessment Authority as the case might be.

21. The Schedule includes in 1 (c) River valley projects, including irrigation projects. The table 1 below gives details of what is mentioned under 1 (c) of the Schedule.

Table 1: Categorization according to EPA, 2006 for River Valley Projects

Project or Activity		Category with threshold limit		Conditions if any
		A	B	
1(c)	River Valley projects	(i) 50 MW hydroelectric power generation; (ii) 10,000 ha. of culturable command area	(i) < 50 MW to 25 MW hydroelectric power generation; (ii) < 10,000 ha. of culturable command area	General Condition shall apply

General Conditions: Any project or activity specified in category 'B' will be treated as category 'A, if located in whole or in part within 10 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically Polluted areas as identified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, and (iv) inter-State boundaries.

22. This project will therefore need to look at, based upon the activities planned and finalized under the MFF the implication of this act. According to the activities finalized there may be a need to take environmental clearance for the project by the Government of India.

23. As can be seen from the General Conditions of the notification certain projects which are category B, may be considered as category A if they fulfil any of the conditions listed above. Both Bhadra and Gondi are near protected areas, with part of the Bhadra Canal system passing through forest land. Also, the Bhadra Tiger Reserve is close to the project area. VNC may also be impacted by this project due to its proximity to Daroji Bear Sanctuary. Therefore, there is a need to clearly identify the distance from protected areas to the project sites as notified under the Wildlife Protection Act, 1972 and obtain the required clearances. This should also be done for TLBC as a part of project preparation as there are forest lands in the area that may be protected under the act. Also, it is understood that the stretch of River Bhadra at Bhadrawati has been identified by the Central Pollution Control Board as critically polluted. Condition (ii) applies if the subprojects are within 10 km of critically notified area. Projects must also be examined for possible concern under condition (iii) and (iv). While condition four would not be applicable to Bhadra or Gondi, it may be applicable to TLBC or VNC as part of the canal network could be within 10 km of the border with Andhra Pradesh.

24. For any project that requires an environmental clearance under the Government of India's EPA, 1986 there will be a need for an accredited consultant registered with the Ministry of Environment and Forests to undertake the EIA and obtain a clearance from it, as has been stated in the Office Memorandum: Accreditation of the EIA Consultants with Quality Council of India (QCI)/ National Accreditation Board of Education and Training (NABET) Dated 9th December, 2009 and available at the ministry's website.

2. The Biological Diversity Act, 2002

25. According to this act, where the Central Government has reasons to believe that an area rich in biological diversity, biological resources and their habitats is threatened by overuse, abuse or neglect, it could issue directives to the concerned State Government to take immediate ameliorative measures. The Central Government, as seen appropriate, integrate the conservation, promotion and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies. The State Government, under this act, can also declare areas of biological importance as heritage sites.

26. Based on this acts recommendations, the state has started to create Biodiversity Management Committees in Karnataka. The purpose of these committees is promoting conservation, sustainable use and documentation of biological diversity including preservation of habitats, conservation of land races, folk varieties and cultivars, domesticated stocks and breeds of animals and micro-organism.

27. Considering that the project area is close to the UNESCO Man and Biosphere (MAB) site – the Nilgiri Biosphere reserve, a tip of which is the Bhadra Wildlife Sanctuary, and there are other wildlife areas such as the Daroji Bear Sanctuary in Bellary, near the identified project area, there could also be important biodiversity, animal corridors or other sensitive areas in and around the catchment area. Therefore, while planning activities of the different Tranches of the MFF there will be a need to look carefully at possible biodiversity concern. As an example, discussions with the State Biodiversity Board highlighted concerns if changes to irrigated agriculture resulted in changes to the bear sanctuary ecosystem. This would particularly be the case where there is irrigation expansion or encroachment onto neighbouring areas. Another concern highlighted by the State Biodiversity Board has been the change of the agro-ecosystems due to increased emphasis on high yielding variety crops and other more economically attractive crops. Appendix 1 of this document provides a list of some biodiversity hotspots as identified by the State Biodiversity Action Plan which in or around the project command area or could be in the areas of influence of the catchment and command areas. All subproject assessments must review if project activities lie within or in close proximity to these hotspots, and if required take appropriate actions minimise any adverse impacts from project activities to them.

3. Karnataka Forest Act, 1963, Karnataka Forest Rules, 1969, Karnataka Preservation of Tree Act, 1976

28. The Karnataka Forest Act defines the use and management of Reserved Forests, District Forests, Village Forests and Private Forests, the control of forest products – both timber and other forest products. It also defines 'reserved trees' or trees that cannot be cut without permission from the Forest Department and the cutting of 'Government Trees' from private lands. According to the Tree Act the felling of any tree; even on private lands, requires permission from the appropriate authority for the area, as specified in the legislation. A few exceptions to the legislation have been given in chapter 5 of the document. The legislation also mentions that there is a need to plant trees of the same or different species in lieu of the felled trees, as directed by the Tree Officer.

29. It is likely that some of the construction activity may result in the removal of some trees, whether to access identified intervention areas, create infrastructure or even use of wood as fuel wood by the construction labour or other uses. Therefore, this legislation is expected to be relevant to the project and as required trees to be removed should be identified, permission taken and required compensation made.

4. Karnataka Groundwater (Regulation for Protection of Sources of Drinking Water) Act, 1999

30. This bill defines the procedures for sinking of wells near public drinking water sources, declarations of watersheds as over exploited and the prohibition of sinking wells in such watersheds and the abstraction of water from wells in the watersheds.

5. Karnataka Act No. 25 of 2011. The Karnataka Groundwater (Regulation and Control of Development and Management) Act 2011

31. This act further strengthens the Karnataka Groundwater (Regulation for Protection of Sources of Drinking Water) Act, 1999 as it to bring a general legislation to control in-discriminatory

exploitation of ground water especially in the notified areas in the State. This act also provides for declaration of areas as drought hit, restriction and regulation of use of groundwater in notified areas and specifying minimum distance between irrigation bore wells.

32. This legislation could become relevant as some of the project areas such as in Raichur are drought prone and therefore any conjunctive use plan would be dependent upon existing restrictions. Similarly, with the minimum distance between irrigation wells, there would also be a restriction on the number of wells that can be dug for irrigation purpose.

33. If any conjunctive water use plan is to be developed, this legislation must be considered and required permissions taken while developing the plan.

6. Insecticide Act, 1968

34. This act provides a list of pesticides which are restricted or banned for use in India. There is a list of 34 pesticides and formulations banned for use in India. There are another seven withdrawn pesticide, eighteen refused registration and thirteen for restricted use in India.

35. Discussions in the field identified the use of pesticides restricted in India like endosulphan and monocrotophos. The major reason for this use is that they are considered extremely effective in comparison to other known formulations by the farmers. The project would therefore need to undertake concentrated efforts to ensure that such formulations are not used and appropriate alternate pest management techniques are known and understood by the farmers. The environmental assessments will therefore need to identify appropriate actions to ensure this.

7. Noise Pollution (Regulation and Control) Rules, 2000

36. This legislation defines the levels of noise permitted in each area, including from vehicular traffic, generators, construction activities and mechanical devices. This rule would be important especially during the construction period of the project. The ambient air quality standards under this rule are given in the table below (Table 2). These levels need to be adhered to for all project activities.

Table 2: Noise Pollution Standards for Various Locations

Area Code	Category of Area/Zone	Limits in dB(A) Leq *	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

8. Air (Prevention and Control of Pollution) Act, 1981, its Rules and amendments

37. Under this Act, Boards (Central and State) for the prevention and control of air pollution have been set up to monitor and manage activities that would lead to air pollution in India, declare air pollution control areas. The act also sets ambient air quality standards for industrial, residential and ecologically sensitive areas.

38. This will be important during the construction phase, where there is likely to be use of diesel generators for provision of energy and other activities that may result in air pollution. Also, based

upon the area the project activities are underway, the standards, as defined by the Act are to be adhered to. These standards are given in the Appendix 2.

9. Water (Prevention and Control of Pollution) Act, 1974, its Rules and amendments

39. This law is to control and prevent water pollution. This legislation also defines discharge standards and permit needs for any effluent/wastewater discharged. It includes surface and ground water and marine discharges. The Act also discusses possible water pollution, prevention and control areas for the application of this act.

40. Presently the project does not envisage undertaking any activity that would result in effluent discharges and therefore permission under this act is not required. Nonetheless, at the construction phase of the project, there may be a need to look at possible discharge from various activities to ensure that discharges do not result in the change in the quality of water bodies, whether temporarily or permanently. Water quality standards for different uses have been defined by the Central Pollution Control Board, Government of India.

10. Manufacturing, Storage and Transportation of Hazardous Chemicals Rules, 1989 and Amendments

41. This Rule is for the management and transportation hazardous chemicals and substances – that include toxic and flammable substances, their use, processing and storage. Schedule 1 to 4 of this rule describes what is categorized as hazardous, their quantities and level's of toxicity. These include a number of pesticides, and liquid and gaseous fuels. According to the rule, the agency needs to identify possible accidents and risk from the chemical during transport, storage or usage, ensure ways to avoid any hazard to take place and in case of an accident, ensuring clean up and reporting of the accident to appropriate authority. The rule also states that no industrial activity is to start till a safety report is filed to the concerned authority according to Schedule 8 of the rule, which needs to be adhered to and no changes in activities undertaken without updating of the report with another 90 days notice. Equally, any hazardous chemicals stored or transported need to be labelled as specified in the rules and an updated safety data sheet to be kept.

42. This could be relevant to the project as there would be certain chemicals and fuel likely to be stored for various project needs. Some of these could be flammable or toxic. Prior to starting any activity the project would need to identify if there are any chemicals as identified in Schedule 3 of the project. If so, appropriate handling procedures and safety permits etc would need to be developed and submitted to the concerned authority.

11. Wetlands (Management and Conservation) Rules, 2010

43. This rule defines a wetland – which according to the rule is 'an area of marsh, fen, peat land or water; natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six meters and includes all inland waters such as lakes, reservoirs, tanks, backwaters, lagoons, creeks, estuaries and manmade wetlands and zones of direct influence of wetlands that is to say drainage areas or catchment areas of the wetlands as determined by the authority, but does not include main river channels, paddy fields and the coastal wetlands covered under the notification of the Government of India in the Ministry of Environment and Forests, S.O. 114 (E) dated 19 February, 1991 published in the Gazette of India Extraordinary, Section 3, Sub-Section (ii) of dated the 20th of February, 1991. The rules also identifies various types of wetlands including those in UNESCO World Heritage sites, ecologically sensitive areas, below 2500 m with an area of at least 500 ha, or other notified wetlands or those identified by the Wetland Authority.

44. Activities not permitted in such areas are identified and include reclamation, setting up of new or expansion of existing industries, dumping of waste or discharge of effluents, any activity that adversely impacts the wetland ecosystem, amongst others.

45. Any activity that is to impact either of the dams – Bhadra or Tungabhadra may be of concerns as the reservoirs of these dams are defined as wetlands by the Wetland Rules. Also, any activity that could have an adverse impact on wetlands in the project area must be carefully redesigned to ensure that they are according to this legislation.

12. Draft Guidelines for Integrated Water Resource Development and Management, 2010, Central Water Commission

46. The Guidelines mention the need to consider ecological needs of water and therefore the maintenance of appropriate minimum flows of rivers for ecological needs, aesthetics and other requirements. The guidelines go further and mention the need for catchment treatment, integrated watershed projects, restoration of ecological balance. No thumb rules or calculations to assessing minimum flows are given in the guidelines.

47. At present, it is understood that minimum flows downstream of the Tungabhadra Dam are not maintained, resulting in many months when the river flows are mainly constituted of sewage discharged. Considering the IWRM approach, and the suggestions of the draft guidelines this project should include environmental flows for the Tungabhadra as a part of the modernization activities.

13. The Ancient Monuments and Archaeological Sites and Remains Act, 1958, The Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010 and their rules and amendments, and The Karnataka Ancient and Historical Monuments and Archaeological Sites and Remains Act, 1961

48. This act identifies limits of prohibited and regulated areas and the activities that can be carried out in them and the required permissions. According to this Act, areas within a 100 meters radius of notified monuments are prohibited and another 200 meters regulated. However, if required this area can be extended to protect the monuments and archaeological site. Any work in the prohibited area needs to be carried out by the archaeological officer and if work is carried out in a regulated area by persons other than the archaeological officer then there is a need for permission to undertake the work as defined in the regulation. Also, for any work in either the prohibited or regulated area permission is required to carry out any work. However, this Act also defines the sort of work that can be carried out within areas notified under this act. Furthermore, any construction, mining or other activity in the vicinity of a protected or regulated area would also need permission from the competent authority.

49. Also, these regulations prohibit cultivation within protected areas if it involves digging of more than 1 foot of soil.

50. These Acts and their associated regulations and other legislation are important for the project both as there are a number of notified monuments in the project area and that there is a possibility of a chance finding while carrying out various project activities. In the case of Humpi, and its core, buffer and peripheral area the Humpi World Heritage Management Authority and its associated Act must be followed. This is briefly discussed below.

14. The Hampi World Heritage Area Management Authority Act, 2002

51. This Act is for the protection and preservation of the Humpi World Heritage site and its cultural identity. It defines the core, peripheral and buffer zones for Humpi. Based upon this act a development plan for the heritage area has been developed. This Act also specifies that any development activity needs prior written permission from the authorities identified in the Act prior to starting the activity. The act also identifies a special authority the Hampi World Heritage Area Management Authority (HWHAMA) for the protection and management of the area.

52. This act is extremely relevant for all project areas that will be within the core, buffer and peripheral area of the Humpi Heritage area. This is therefore specifically relevant to the Vijayanagara Channel system. Any project activities within zone identified under this Act must be undertaken after consultation with the HWHAMA.

C. Asian Development Bank

53. From ADB's perspective there is the 2009 Safeguard Policy Statement (SPS). The SPS is a set of operational policies that seek to avoid, minimize, or mitigate adverse environmental impacts of development activities where ADB is involved. To ensure this, impacts of project activities on the environment are to be identified early in the project cycle so that appropriate mitigation and management actions are undertaken..

54. In the case of a Multitranche Financing Facility (MFF) an Environmental Assessment and Review Framework (EARF) is also to be developed. The EARF will provide guidance to the assessments of the subprojects of the subsequent tranches which are prepared after Board approval.

55. The ADB has also developed categorisation of all projects according to the level and type of impacts and type of investments. ADB uses a classification system to reflect the significance of a project's potential environmental impacts. Projects can be categorised into four depending upon their impacts. These are,

(i) Category A. A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
(ii) Category B. A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.
(iii) Category C. A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
(iv) Category FI. A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI (Financial Intermediary).

56. To ensure that people's concerns and needs are included in project design consultation with those impacted by the project need to be undertaken early in the project design cycle. Furthermore, there is a need for the client to identify an appropriate grievance redress system for project impacted stakeholders and to ensure transparency. Each tranche will be categorized once interventions and

their locations are identified. If the identified project is categorised as a Category B project, an IEE will be undertaken and if it is a Category A, an EIA.

D. Other Relevant Policies and Principles

1. Wildlife and Biodiversity

57. There are a number of different international conventions that discuss concerns of wildlife, biodiversity and their conservation and management. These also have complementary legislation developed by the national and state governments, of which the relevant ones are discussed in the section on Indian legislation.

58. Ramsar Convention: India is a signatory of the Ramsar Convention. In support to this the Indian government has also recently brought out wetland conservation and management rules in 2010. At present India has a total of 25 wetland sites identified for conservation under the Ramsar Convention in India. None of these are in or near the project site. However, if any wetlands are identified subsequently actions are required in the Ramsar Convention need to be reviewed in terms of the project activities.

59. Convention on Biodiversity: This convention discusses the need for countries to conserve and manage their biodiversity through development of national strategies, programs and projects. The conventions also talks of integration and conservation of biodiversity in relevant sector and cross-sectoral plans, policies and programmes.

60. This, in the Indian context is covered through the Biodiversity Act, 2002 which is discussed in the section on Indian legislation. Based upon this Act a number of biodiversity hotspots have been identified under the project. Upon finalisation of activities under this project it will be possible to understand the proximity of the biodiversity hotspots to project locations.

61. Convention on Migratory Species: Concerned about the wildlife habitat at the global level of migratory species, this convention is also known as the Bonn Convention. The Convention aims to conserve migratory species throughout their range. So far no migratory species has been identified in the project area. However, if any species are identified appropriate management actions will be undertaken.

62. Conservation and protection of Siberian Crane, MoU: This MoU is to conserve and protect the Siberian Crane, which is also an endangered species listed in Schedule 1 of the Wildlife (Protection) Act, 1972. Also, it is listed as critically endangered species according to the MoEF's 2011 list of critically endangered species. Based on current knowledge, this species is not found in the project area.

2. Other Conventions

63. UN Convention to Combat Desertification: According to this convention, signatory countries are to develop and carry out national, regional and sub-regional plans to combat desertification. To this effect the Government of India has developed a desertification cell in the Ministry of Environment and Forests which undertakes all activities for combating desertification. Discussions so far have not identified any activities under this convention in the project area. In fact, the project provides an opportunity, through its IWRM perspective to provide a combination of more rational irrigation and agricultural practices and watershed management activities and land and water management improvement and overall land management, all of which can also ensure a reduction in land degradation and resultant desertification.

64. UNFCCC and Kyoto Protocol: The Government of India is a signatory to the Kyoto Protocol which is to address climate change and reduction of greenhouse gases. The project provides opportunities to provide in the long term improved agricultural practices and crop diversification that includes millets and other traditionally grown crops may in the long run also have a positive impact on GHG emissions.

E. Major Environmental Compliance Requirements

65. Given below (Table 3) are the major Indian legislations that are applicable to this project along with the actions that would need to be undertaken for each of these regulations. These must be followed as a part of the environmental compliance activities for the subprojects under this project.

Table 3: Environmental Compliance Requirements Legislative Needs

Component	Applicable Legislation	Action Required
All irrigation project modernization activities	Environmental (Protection) Act, 1986	Requires environmental clearance – as discussed in the Schedule of the act
Any component where there is a need to acquire forest land or access any produce from forest produce Any trees cut by project activities	Karnataka Forest Act 1969, Wildlife Act, 1972 and Karnataka Preservation of Tree Act, 1976	Apply for permission and undertake any action as directed by the Forest Department Apply for permission and undertake any action as directed under this act – e.g. undertake compensatory plantation activities.
Any impact on biodiversity hotspots or sensitive areas due to project activities	Biodiversity Act, 2002	Consult with the Biodiversity Board to identify any sensitive areas and appropriate actions to minimize impact from project activities
For conjunctive water plans where groundwater is to be used	Karnataka Groundwater (Regulation for Protection of Source of Drinking Water) Act, 1999 and Karnataka Groundwater (regulation and Control of Development and Management) Act 2011	Taking permission for sinking of bore wells, ensuring minimum distance between irrigation wells and follow directions of legislation if area declared drought hit.
Especially during construction period	Noise Pollution (Regulation and Control) Rules, 2000	Ensure all activities adhere to the existing noise limits
Pollution due to vehicle and construction activities	Water (Prevention and Control of Pollution) Act, 1974	Ensure any activity undertaken is within the existing discharge standards, based upon the designated use of a water body.
At time of construction especially when there is likely to be use of diesel generators for energy and the various vehicles and machinery at the site and for transportation. Also at various quarry and other sites resulting in atmospheric dust	Air (Prevention and Control of Pollution) Act, 1981	Ensure that all activities comply with the existing air quality levels. Vehicles have required pollution under control certification from appropriate authorities

Component	Applicable Legislation	Action Required
Waste dumping at construction or in the O&M phase	Wetland (Management and Conservation) Rules, 2010	Ensure compliance to the rules by ensuring identified waste disposal is in water bodies and wetlands.

III. INSTITUTIONAL ARRANGEMENTS AND SYSTEMS

66. Given below are the national and state level government agencies focusing on environmental management and regulation. The state level agencies are directly functioning below their national level agencies.

A. National Level

1. Ministry of Environment and Forests

67. The Ministry of Environment & Forests (MoEF) is the nodal agency in India for planning, promoting, co-coordinating and overseeing the implementation of environmental and forestry programme. The principal activities undertaken by Ministry of Environment & Forests consist of conservation & survey of flora, fauna, forests and wildlife, prevention & control of pollution, afforestation & regeneration of degraded areas and protection of environment, in the frame work of legislations.

68. It is located at the national level and has regional offices for 4 regions and works in coordination with the national office to undertake any work and clearance and other consultation related activities. This includes one for the South region for which the office is located in Bangalore. This Ministry is also in-charge of any forest related clearances as identified under the forest acts and to be undertaken by the central ministry.

2. Central Pollution Control Board

69. Central Pollution Control Board (CPCB) is the statutory organisation constituted in 1974. The board provides field information and technical services to MoEF. The Board also monitors and oversees the implementation of the Environmental Protection, Air and Water acts. The functions of the board are,

(i) Advise the Central Government on any matter concerning prevention and control of water and air pollution and improvement of the quality of air
(ii) Plan and cause to be executed a nation-wide program for the prevention, control or abatement of water and air pollution
(iii) Co-ordinate the activities of the State Board and resolve disputes among them
(iv) Provide technical assistance and guidance to the State Boards, carry out and sponsor investigation and research relating to problems of water and air pollution, and for their prevention, control or abatement
(v) Prepare manuals, codes and guidelines relating to treatment and disposal of sewage and trade effluents as well as for stack gas cleaning devices, stacks and ducts
(vi) Perform such other function as may be prescribed by the Government of India

B. State Level

70. At the state level in Karnataka, there are 3 major government agencies working on the environment. These are the Forest Department, Department of Ecology and Environment and the State Pollution Control Board (KSPCB).

1. Department of Ecology, Environment and Forests, GoK

71. Department of Ecology, Environment and Forests (DoEF) is the apex body in the state of Karnataka with administrative control of environmental management in the state. The department through KSPCB administers the enforcement of various laws and regulations of Government of India. The department formulates environmental management and policy guide lines for Karnataka and grants clearances for projects under its purview. The Department of Ecology and Environment looks at the enforcement of Category B projects under the EIA notification while the Category A projects are directly handled by the central Ministry of Environment and Forests. In order for the Department to provide advice for clearance of Category B projects, it has a State Environmental Impact Assessment Authority and the State Expert Appraisal Committee to support this Authority. The Department also evaluates the effectiveness of government agencies to assess the impact of their activities on the environment and aims at strengthening local institutes to address environment problems. This Department is also provides policy advice on climate change and at present is also undertaking studies through the Environmental Management Policy Research Institute on climate change.

72. The department is headed by a Principle Secretary to Government and Supported by Secretary (Ecology and Environment). The Secretary (Ecology and Environment) is supported by two Under Secretaries and a Director (Technical).

2. Forest Department

73. The Forest Department looks at the implementation of the wildlife and forest acts and the management of forests, national parks and sanctuaries. Any clearance for working in forest areas requires consultations and clearance from them. If within their mandate, the department will give the clearance otherwise it will be referred to the regional office of the MoEF and/or the Central office of MoEF.

3. Karnataka State Pollution Control Board

74. KSPCB is the regulatory body in the state of Karnataka for enforcing various environmental legislations of the Government of India. The KSPCB looks at the implementation of the national Environmental (Protection) Act 1986, and the Air and Water pollution abatement acts and the provision of licenses under these acts. While the regulatory powers are delegated to KSPCB from CPCB, the administrative control of the board rests with DoEF. More specifically, the functions of the board are listed below.

(i) Implementing the provisions of EPA 1986, Water and Air Acts
(ii) Advise State Government in respect of suitability of particular area for industrial development
(iii) Assess the quality of environment in terms of ambient air and water quality through monitoring
(iv) Issue and enforce the consent orders issued for industrial pollution control
(v) Oversee, supervise and regulate water, air, solid, bio-medical and hazardous waste management in urban areas

75. The board is headed by a Chairperson who is supported by a Member Secretary and a Chief Environmental Officer. The Chief Environmental Officer is supported by Regional Environmental Officers and the District Environmental Officers in each of the district of the state. The Board has its Central Office at Bangalore. The enforcement of the Acts and Rules are being implemented through thirty three Regional Offices spread throughout the state. The Central laboratory of the Board is located at Bangalore. Regional laboratories have been set up along with Regional Offices.

76. Depending upon the needs of the project, for any clearances these agencies will need to be contacted as directed under the relevant acts discussed in the legislation section.

4. Karnataka Neeravari Nigam Limited and Environment

77. The Karnataka Neeravari Nigam Limited (KNNL) does not have any specific environment unit or specific environment related activities. Environmental clearance is taken for projects with Central Government funding. From this funding an accredited consultant is hired. The consultant is responsible for doing the environmental assessment, public consultation and liaising with the Ministry of Environment and Forests for getting clearances from the ministry. Any monitoring activities identified under the EIA are also outsourced to a consultant qualified to undertake the activities.

78. Project's where an environmental clearance and required follow up activities are to be undertaken, KNNL supervises the overall implementation of activities. The officer in-charge, the Chief Engineer (CE) or the Superintending Engineer (SE), is to ensure any environment activity required – is implemented. In case of larger projects there is a CE in charge. Otherwise an SE oversees the implementation of the Environmental Assessment.

79. At the field level the Executive Engineer (EE) of KNNL oversees all construction and implementation actions. The EE will be supported by the Assistant Executive Engineer (AEE). Therefore, any supervision of actions identified in the Environment Report to be carried out at the field level is to be undertaken by the EE and AEE.

80. At present any grievance that may occur at the time of project implementation is first referred to the EE. If the EE is unable to manage the problem, the concerns are to be handled by the SE/CE. Usually grievances are adequately redressed though this system.

IV. ANTICIPATED ENVIRONMENTAL IMPACTS OF SUBPROJECTS

81. This section briefly discusses possible impacts from project activities. This can be used as a guideline, along with its supporting appendix 4 for identifying probable subproject impacts. The second subsection of this section lists types of activities not to be taken up as a part of project activities. In case any identified subproject or activity is likely to result any of the concerns listed in the following subsection without appropriate mitigation measures such as design changes to ensure that no such impact occurs, the activity should not be undertaken.

A. Probable Impacts from Subproject Activities

82. Details of possible environmental impacts from project activities are given in Appendix 4. These are the most likely impacts and could be used to guide the assessment process for the future tranches of the MFF. However, an assessment for activities and subprojects as planned for each tranche must be undertaken to ensure all relevant environmental impacts are identified and the Environmental Management Plan (EMP) is developed for the project according to its needs. The table 4 below briefly outlines possible areas of impacts from project activities. In case there is a secondary or a minor impact it is not highlighted here, but will be discussed in appendix 4 that details project related impacts.

83. Subsequent tranches of the Program are likely to consist of modernization of part of the TLBC and VNC irrigation subprojects, WUCS and other institutional capacity building and overall, implementing the IWRM actions as described for output-1.

84. Modernization activities (which are the only physical interventions to be undertaken under the program) include: (i) irrigation canal lining (pre-cast concrete and in-situ lining);(ii) provision of additional control and regulation structures (like cross regulators and proportional offtakes); (iii) selective on and off-line storages; (iv) village road bridges; command area development works comprising minor and field channel improvements, offtake structures and improved field management of water using high efficiency irrigation systems (like drip irrigation); (v) buried conveyance pipes for improved field distribution of irrigation water and (vi) installation of discharge measuring and other telemetry instruments within the irrigation subproject and throughout the sub-basin.

Table 4: Probable impacts from project activities

Impact category	Impact	Project phase		
		Design	Construction	O&M
River system and environmental flows	▪ Change in water availability ▪ Competition among users ▪ Change in river course	X	X	
Wetlands and water bodies	▪ Degradation and eutrophication ▪ Waste dumping and silting ▪ Improvement due to better catchment management	X	X	X
Groundwater	▪ Contamination ▪ Rise in water table and water logging ▪ Excessive withdrawal and aquifer level decline	X	X	X
Water quality	▪ Improved due to better catchment management ▪ Degradation of quality	X	X	X
Air and Noise	▪ Vehicular pollution ▪ Dust and high SPM ▪ High level of noise from construction plant	X	X	
Soil degradation	▪ Increased salinity or alkalinity and contamination due to poor drainage or improper soil management ▪ Soil degradation and toxicity due to excessive agrichemical use ▪ Soil exhaustion ▪ Compaction or erosion ▪ Disposal of silt from canals to fields	X	X	X
Biodiversity	▪ Degradation of ecosystems ▪ Competition with invasive species ▪ Material procurement creating habitat loss or degradation ▪ Poor management of agrochemical and other waste degrading ecosystems ▪ Loss of agro-biodiversity	X	X	X
Infrastructure and economic activities	▪ Temporary disruption of routes etc due to construction activities	X	X	X

Impact category	Impact	Project phase		
		Design	Construction	O&M
	▪ Increased competition for water between different users ▪ Poor agro practices leading to reduced agriculture yields ▪ Quarrying impacting aquifers ▪ Degradation of local fisheries ▪ Reduced pastures and grazing lands and other uses of common lands ▪ Disruption, breakage and degradation of local infrastructure – such as energy, navigation and WSS			
Social	▪ Possible increase in vector habitats ▪ Increase in water borne diseases ▪ Conflict with local population during construction	X	X	X

B. Environmental Procedures to be used for MFF subprojects

85. In order to ensure that there is minimum adverse impact due to project activities it is suggested that certain activities which are likely to cause major adverse impacts are not taken up as a part of the project. Considering this, given below (Table 5) is a list of possible criteria to be used while identifying subprojects or activities for subsequent tranches of the TA. In case any of these issues are identified, the project must be carefully reconsidered and designed as required.

Table 5: Environmental Criteria for Sub-project Selection

Criteria
• Project or its activities not to destroy, encroach or damage any protected areas, including reserved forests or biodiversity conservation hotspots (identified in the State Biodiversity Strategy and Action Plans), Wildlife Sanctuaries or National Parks. • Project or its activities should not destroy, encroach upon or damage any wildlife migratory routes, corridors or fly paths. • Activities not to destroy/disturb any historical and cultural places/values, including archaeological sites. • The project should not result in social conflicts, and should minimize resettlement issues. • The project is not to result in environmental degradation such as watershed degradation, increased water resource degradation or the destruction of private or government owned forested lands. • Project design should not result in conjunctive use plans that create unsustainable groundwater withdrawal. • Project will not fund any activities listed in ADB's Prohibited Investment Activities (reference: Appendix 5 of ADB's SPS 2009) • Project should not involve any measurable adverse impacts on areas of critical habitat as defined by ADB's SPS (2009) (reference: Appendix 1, para 28, including footnote 5)

V. ENVIRONMENTAL ASSESSMENT PROCEDURES

86. In order to ensure that identified program activities follow required legal procedures and regulatory procedures of ADB, Government of India (GOI) and the State Government of Karnataka (SGOK), and ensure the proper implementation of the identified EMP a set of environmental

procedures have been identified. Given below (Table 6) are these environmental procedures and actions that are to be undertaken at each stage of the project. These have been categorized according to responsibilities of different agencies - GOI/SGOK and ADB and project stage and can be used as guidelines for activities to be planned under subsequent tranches and their subprojects and activities.

Table 6: ADB and Government of India Environmental Procedures and Actions during Subproject Processing

Project Stage	ADB Procedures	GoI and State Government Procedures	Responsible Agency/Personnel
Subproject Identification	▪ REA Checklist ▪ Identification of project category A/B/C, F1 ▪ ADB SPS 2009	▪ Categorization (A or B) according to Schedule and General/Specific Conditions in GoI EPA, 1986 and amendment 2006 ▪ Application for Environmental Clearance (EC) after the identification of the prospective site as a part of the project preparation activities. ▪ Clearance criteria given in the Schedule of EPA, 1986 revision 2006, and discussed in section 2 above. ▪ In case of Category A clearance to be taken from MoEF. For Category B clearance from SEIAA. ▪ Ancient Monuments and Archaeological Sites and Remains Act, 1958 and HWHAMA Act, 2002	▪ PIO Executive Engineer for a particular sub-project applies for clearance after indicating suggested categorization.
Feasibility study and Detailed Design	▪ EIA/IEE (EMP for Category A and B) Based upon project category environmental assessment undertaken for project on ADB processes, as outlined in Appendix 3 ▪ If special surveys etc are required given specific project location –they need to be commissioned. All identified issues from these studies should be incorporated in the environmental assessment and	▪ As required, undertake environmental assessment – and get clearance from required authority. ▪ As required, take permission, clearance and design modification to ensure sensitive cultural and archaeological sites sanctity is preserved. ▪ Include any identified actions in the project design.	▪ Zonal Chief Engineer for a particular sub-project

Project Stage	ADB Procedures	GoI and State Government Procedures	Responsible Agency/Personnel
	identified issues incorporated in the project design and EMP. ▪ Submit EIA/IEE for ADB's review and obtain clearance		
Construction	▪ Include EMP in contract documents and ensure compliance through contractor clauses, training activities etc in place and appropriate monitoring system in place and monitoring is undertaken by identified agency. ▪ Suggest changes in implementation if any new issue, not identified in the assessment is found at the implementation stage ▪ Update EMP as required ▪ Environmental monitoring reports to be submitted to ADB to be uploaded to ADB's website	▪ Ensure compliance to EMP, make clauses in contractor's agreement ▪ In case required work with other government agencies for ensuring all required regulations are complied to and any concern/issue that may come up during the construction phase is also sorted upon being identified. An example of this could be possible archaeological chance findings.	▪ PIO Executive Engineer (EE) for a particular sub-project ▪ PIO EE with assistance from the Environment Specialist will prepare Half-yearly reports on EMP implementation will be submitted to MoEF regional office, Bangalore and ADB
O&M	▪ IEE/EIA and EMP and monitoring reports to be uploaded on website ▪ Suggest changes in implementation if any new issue, not identified in the assessment is found at the implementation stage	▪ Monitor implementation of environmental assessment needs, as identified through the project assessment and those agreed through ADB IEE/EIA. IEE/EIA and EMP and monitoring reports to be uploaded on website. ▪ Suggest changes in implementation if any new issue, not identified in the assessment is found at the implementation stage	▪ PIO EE with support of PSC

87. Appendix 3 outlines the Table of Contents of the ADB environment report.

VI. CONSULTATION, INFORMATION DISCLOSURE AND GRIEVANCE REDRESSAL MECHANISM

88. Consultation and information disclosure would be needed at various stages of the project. These are outlined below.

(i) At time of identification of project undertake consultation to ensure all concerns of project stakeholders are incorporated in the project design. Consultations should help inform project design and therefore there is a need to ensure consultations are undertaken at the time of identification of project feasibility and before the finalization of design.

(ii) Depending upon the assessment needs of the project, such as whether it is a Category A, B, C or F1 under ADB guidelines or GoI Category A or B under EPA, 1986 EPA guidelines consultations must be undertaken.

(iii) Consultations must be documented and made a part of the final environment report.

(iv) Any issues identified during the consultations should be considered during the final project design.

(v) Consultations will continue during subproject implementation.

(vi) Environment Assessment documents will be available on KNNL (program) and ADB websites with executive summaries available in Kannada, the local language. Hard copies for reference will be made available with local language executive summary translations at the Executive Engineer (EE) in charge of the scheme and the Superintending Engineer's (SE) offices and in the District Commissioner's office in each of the project districts. There will also be a notice on the website displaying the documents stating where the hard copies are available.

89. Grievance redressal needs to be considered to ensure any unintended consequences, or violations of planned actions and activities is brought to the notice of the authorities to ensure compliance and resolution of problems and issues faced by the local population. The grievance redressal mechanism must,

(i) Be accessible to the local population and therefore should be present close to the area where project activities are under implementation.

(ii) Ensure fairness and transparency in any grievance system planned. This could include making information on project activities available at the impacted areas itself, keeping a register of complaints and a system to identify progress of complaint and resolution taken, providing for a higher level authority for any problem resolution that has not be solved at the local level, ensure that contact information on the existing grievance redressal mechanism is available at the project implementation/construction sites.

(iii) Ensure there are time limits set for solving all issues at each level of the system and it is adhered to.

(iv) Also, if any adverse impact is identified by the local population, they need to be immediately addressed and the grievance redressal system should be able to include any such complaints into project design.

(v) Records on how grievances are addressed should be maintained at a central place where the public could access these records

(vi) It must be a dynamic process that is able to help correct any adverse impact that project activities occur

90. The overall management of this program includes a program management unit (PMU) located within the KNNL and Managing Director, KNNL will be the PD. The PMU staff will be based in the PD office in Bangalore. The PD will operate under the overall guidance and with the support of the Principal Secretary WRD and the PSC. The PMU will comprise the following units: (i) monitoring and communication, (ii) budget and administration, and (iii) irrigation management. The PMU will be supported by program support consulting (PSC) services. They will jointly undertake environmental safeguard assessments for subprojects under tranche-2 and prepare the required safeguard documents in accordance with the program EARF.

91. For field implementation (Output 2), each irrigation project to be modernized will have a dedicated PIO under a program implementation officer of the rank of the Chief Engineer of that zone reporting to the PD. The program implementation officer will be supported by the zonal Superintending and Executive Engineers.

92. Dedicated irrigation sub-divisions will be established under each field PIO with the full compliment of required staffing which will be dedicated for implementation of program activities. These will include Assistant Executive Engineers, Assistant Engineers, Junior Engineers and other technical staff. The number of dedicated sub-divisions under the PIO will be determined by the extent of command area and quantum of works to be undertaken. The CADA staff deputed to the PIO will be an Assistant Engineer, Assistant Agriculture Officer and the Senior Inspector of Cooperative Society. The PIO will be provided with WUCS support service teams to maximize field outreach.[1]The engineering staff will be trained by the Environment Specialist of the PSC on environmental monitoring and reporting.

93. The SGOK has published a Citizens Charter[2] providing names and other details of officers responsible for various projects, where citizens can send their grievances. The existing grievance redressal mechanism for KNNL, which is for all grievances not just environment-specific, will be adopted for environmental grievances. The procedure is described below.

94. The first level for grievance redress will be the WUCS, who would be the easiest to contact for farmers and villagers, given their proximity to the subproject area. In case the management board of the WUCS is unable to satisfactorily resolve the problem within a period of 3 to 5 days, the WUCS will assist the complainant register the concern with the Executive Engineer (EE) of the PIO who will satisfactorily resolve the complaint within a week of the complaint being registered. Beyond a week the complaint will need to be forwarded to the Project Manager of the PIO who will be the zonal Chief Engineer of the irrigation subproject. If the complaint is not satisfactorily dealt with within two weeks then it is recommended that the matter may be brought to the notice of the PD PMU. At each level a register documenting the grievance and action taken will be maintained. At a minimum the following must be recorded: (i) basic information about the affected person (name, address, contact number); (ii) category of grievance filed (legal, social, environmental, technical/engineering, financial, etc.); (iii) detailed description of grievance; and (v) type of action taken or to be taken (whether resolved at the specific level or submitted to a higher level). The register will be signed by the officer receiving a grievance and the affected party and the receiver of the complaint. If the grievance has not been dealt with at each of these levels it will be put forward to the Grievance Redress

[1] The organization arrangement of PMU and PIO may be adjusted in later tranches based on implementation experiences.

[2] Reference WRD:158:SAV:2011 dated 21st Oct. 2011

Committee which will comprise of key personnel from the project, affected parties and other agencies as required. The complainant should be informed in writing of the response taken.

95. Through the process, the complainant has access to the state and national legal system and that this is not conditional upon the perceived unsatisfactory outcome of the grievance redress mechanism.. The program website and PIO website may also provide suitable mechanisms for complaints registering. These may be compiled monthly by the EE and monitored with the support of the Environment Specialist of PSC.

96. Appendix 6 of this document gives an outline of the format to be used for consultations during the project.

VII. INSTITUTIONAL RESPONSIBILITIES

97. This section looks at the possible institutional responsibilities of various agencies for the implementation of activities under it and the capacity building needs.

A. Institutional responsibilities

98. The implementation arrangements for the environmental sections will involve various agencies, depending upon activities planned under the project and possible impacts. The major responsible authorities for various activities are identified below (Table 7).

Table 7: Institutional Roles and Responsibilities

KNNL/PMU Environmental Specialist	ADB
Subproject Identification stage	
Environmental safeguard specialists in PMU environmental specialist –will ensure that subprojects are screened for categorization and identified environmental impacts are addressed in the project design..	Ensure screening is done and appropriate assessments are prepared. ADB will review and clear all environmental assessments.
Ensure project gets required clearances in time – KNNL	Ensure all ADB procedures are being followed and required environmental actions are in place. Follow required disclosure process of ADB
Ensure inclusion of Environmental Management Plan in overall project design and use of the Environmental Sub-project design criteria is used to ensure only appropriate projects are taken up – PMU environmental specialist	Review documents for environmental compliance and provide guidance, as required.
Identification and development of contractor agreement – include identified clauses for construction stage are in contract	Review and discuss clauses with EA/IA included for their appropriateness Disclose IEE/EIAs on website
Environmental safeguard specialist to support KNNL in preparation of bidding documents to include EMP as part of the document	Prior review of bidding documents, disclosed on ADB website and KNNL (program) website.
Construction stage	
Ensure contractor understands project environmental needs, has adequate capacity to implement the required actions and has required equipment for the activity and has an appropriate site plan – PMU Environmental Specialist	Review contractors performance and ensure proper safeguard monitoring systems are in place.
Monitoring overall implementation, advising on	Joint monitoring with KNNL to ensure field

KNNL/PMU Environmental Specialist	ADB
additional actions required, support for mitigation of any impacts identified later – PMU Environmental Specialist Where required, also include other government departments for the monitoring activities, such as the HWHAMA for Hampi World Heritage site. PMU Environmental Specialist	level compliance and support, and review of monitoring reports for any further action required
Ground level monitoring of contractor – PMU Environmental Specialist	Undertake due diligence monitoring.
Monitor project for any unforeseen impacts or issues and ensure required actions are undertaken - PMU Environmental Specialist Grievance redressal - ensure that any grievances from any stakeholders are adequately responded to and required amelioration actions undertaken - PMU Environmental Specialist and KNNL Submit periodic monitoring reports to GoI and ADB	Undertake joint monitoring with government to ensure any unforeseen impacts are adequately addressed and if required, request for changes in implementation/construction process Joint monitoring with KNNL to ensure field level compliance and support. Monitor effectiveness of grievance redress mechanism. Review monitoring reports and disclose in ADB website
Operations Stage	
Overall safeguard implementation - PMU Environmental Specialist and EE of the subproject	Joint monitoring with KNNL and implementation support and advisory Undertake due diligence monitoring
Monitor project for any unforeseen impacts or issues and ensure required actions are undertaken – EE of relevant irrigation subproject who is designated to oversee environmental monitoring. Capacity building support to be provided by the Advanced Centre for IWRM.	Undertake joint monitoring with government to ensure any unforeseen impacts are adequately addressed

B. Training and Capacity Building

99. Training and capacity building of various stakeholders involved in the implementation and monitoring of project activities is essential and would need to be undertaken to ensure all identified environmental concerns are properly implemented and adequately monitored. Given below is the suggested training and capacity building plan for the project. Based upon this, project personnel who may need to be trained should be identified and trained for activities. This must be built in the environmental assessment's management plan. The training and capacity building activities will be provided by the specialists of the PMU. The PMU Capacity Building specialist with support from the Environmental Specialist and the Agricultural Specialist will be involved with the training activities.

Capacity Building Activity	Frequency	Type of training	Who will be trained
Awareness on ADB environmental procedures, monitoring and EMP needs and compliance to ADB Conducted by PSC Environment Specialist	Once – project start	Half day workshop	All key stakeholders involved in project design & implementation such as the KNNL
Refreshers programme awareness training – on	Annually	Half day workshop	All key stakeholders involved in project design & implementation

ADB environmental procedures and compliance needs			such as the KNNL
On farm management for improved agricultural practices, IPNM, soil management etc.	Annually once	Half day workshop and various locations	Farmers, CADA, KNNL officials

VIII. MONITORING, ENVIRONMENTAL PERFORMANCE AND REPORTING

100. Since it is planned to have a PMU housed with the KNNL in place at the time of project implementation, most monitoring and guiding activities would be undertaken by the PMU. The PMU will be supported by the PSC Environment Specialist and executive engineers of PIO who will be trained on monitoring the implementation of the EMP . The PSC will support PMU and PIOs in capacity building in ADB and GOI safeguards, developing the required monitoring program in more detail, establishing monitoring locations within the subproject and sub basin and daily support for implementation of the EMP. While some of the monitoring will be undertaken by the contractor (those that are required to monitor impacts of construction related activities) some monitoring will be undertaken by specialist environmental monitoring teams to be recruited by the PMU. These teams will monitor, specific parameters such as soil and water quality to establish the effectiveness of the proposed interventions of improved agricultural practices. The monitoring team will support establishment of a baseline and annual effects monitoring.

101. Monitoring to be undertaken will comprise environmental parameters which will include soil and water quality testing within irrigation subprojects and generally within selected locations in the sub-basin. These will be decided by PSC environment specialist in conjunction with relevant PIO staff. It will facilitate development of the MIS database which will also include environment quality monitoring data. Quality data as indicated in will be collected by a separate dedicated environmental monitoring team (to be recruited during the Poject-1 and to jointly agree on the parameters and locations for monitoring). The team will monitor throughout the entire program implementation (subject to its satisfactory performance which will be annually evaluated). The team will facilitate the EE in preparation of quality monitoring reports and periodic effects monitoring.

102. The EE guided by the environment specialist of the PSC will prepare semi-annual environment monitoring reports and will forward to PMU for onward submission to the regional office of MOEF and ADB. The EE supported by the engineers of the PIO will monitor contractor's performance and recommend corrective action if the EMP is not being complied with. Furthermore, if any unidentified issues do arise during construction the EE together with the environment specialist and contractor must identify remedial action and include it in an updated EMP.

103. The indicative costs of implementing the EMP are in appendix 5. The Environmental Specialist is budgeted under the PSC consultancy contract and is not shown here.

Appendix 1
Biodiversity Hotspots as Identified by the Karnataka Biodiversity Action Plan

104. Given below are hotspots identified by the Karnataka Biodiversity Action Plan. While at present there does not seem to be any issue that needs to be flagged specifically about most of these hotspots, these must be rconsidered while developing projects for the subsequent tranches of the MFF. The only concern identified is on the possible concerns of loss of Agr-biodiversity.

Hotspots of Hope (Source: Karnataka Biodiversity Action Plan)

Ecosystem	Plants	Animals	Habitat	Management Regime	Geographic Location	Taluk	District
Evergreen Forests	*Rhynchostylis, Catlea, Luisia*		Evergreen Forests	Reserve Forest	Kemmannagundi	Tarikere	Chikamagalur
Dry deciduous forests	*Anogeisus latifolia, Terminalia sp., Tectona grandis, Dyospyros melanoxylon*	*Tiger, Leopard, Sambar, Dhole*	Forests	Tiger Reserve	Bhadra		Chikamagalur
Evergreen Forests	*Poeciloneuron indicum*	*Lion-tailed Macaque*	*Poeciloneuron Indicum* Forests	National Park	Bhagavati Valley		Dakshina Kannada, Chikamagalur, Udupi
Grasslands	*Grasses, ground orchids and other herbs*		Montane Grasslands	National Park	Kudremukh National Park		Dakshina Kannada, Chikamagalur, Udupi
Reservoir/ Lakes		*Water Fowl*	Reservoir/ Lakes	Irrigation Department	Nidige		Shimoga
Reservoir/ Lakes		*Water Fowl*	Reservoir /Lakes	Irrigation Department	Soolekere	Channagiri	Davangere
River	*Members of Podostemaceae*	*Freshwater Fishes*	Streams/ Rivers	Irrigation Department	Sringeri	Sringeri	Chikamagalur

Hotspots of Despair (Source: Karnataka Biodiversity Action Plan)

Ecosystem	Plants	Animals	Habitat	Management Regime	Geographic Location	Causal factor	Taluk	District
Agro ecosystem	Crop Diversity		Agro-ecosystems		All taluks			All districts
Evergreen Forests	Canarium strictum, Garcinia gummi-gutta, Syzigyum gardnerii, Depterocarpus indicus,	Amphibians	All	National Park	Kudremukh National Park	Mining		Chikamagalur, Udupi,Dakshina Kannada
Evergreen Forests	Canarium strictum, Garcinia gummi-gutta, Syzigyum gardnerii, Depterocarpus indicus,	Lion-tailed Macaque	Evergreen Forests	National Park	Kudremukh National Park	Mining		Chikamagalur, Udupi,Dakshina Kannada
River	Members of Podostemaceae	Freshwater Fishes	Streams/ Rivers	Irrigation Department	Sharavati River	Monoculture, Encroachment	Sagar, Honavar	Uttara Kannada/Shimoga
River		Freshwater Fishes	Streams/ Rivers	Irrigation Department	Tunga	Flow of untreated sewages, dumping of wastes, washing of vehicles	Harihar	Davanagere
River		Freshwater Fishes	Streams/ Rivers	Irrigation Department	Bhadra	Flow of untreated sewages,dumping of wastes, washing of vehicles	Bhadravathi	Shimoga
River		Freshwater Fishes	Streams/ Rivers	Irrigation Department	Tungabhadra	Pollution in river	Harihar	Davanagere
River		Freshwater Fishes	Streams/ Rivers	Irrigation Department	Bhadra	Pollution in river	Bhadravati	Shimoga

Appendix 2
Standards as defined in the Air (Prevention and Control of Pollution) Act, 1981

Pollutant	Time Weighed Average	Concentration of Ambient Air		Methods of measurement
		Industrial, Residential, Rural and other areas	Ecologically Sensitive Areas (notified by central government)	
Sulphur Dioxide (SO_2), µ/m^3	Annual* 24 hrs#	50 0	20 80	- improved West and Gaeke - Ultraviolet fluoresence
Nitrogen di oxide (NO_2), µ/m^3	Annual* 24 hrs#	40 80	30 80	- Modified Jacob & Hochheiser (Nat-Arsenite) - Chemiluminescence
Particulate Matter (size less than 10 µm) or PM_{10} µg/m^3	Annual* 24 hrs#	60 100	60 100	- Gravimetric - TOEM - Beta attenuation
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$ µg/m^3	Annual* 24 hrs#	40 60	40 60	- Gravimetric - TOEM - Beta attenuation
Ozone (O_3) µg/m^3	8 hrs* 1 hr#	100 180	100 180	- UV photometric - Chemilminescence Chemical Method
Lead (Pb) µg/m^3	Annual* 24 hrs#	0.50 1.0	0.50 1.0	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
Carbon monoxide (CO)	8 hrs# 1 hrs#	02 04	02 04	- Non Dispersive Infra Red (NDIR) spectroscopy
Ammonia (NH3) µg/m^3	Annual* 24 hrs#	100 400	100 400	- Chemiluminescence - Indophenol blue method
Benzene (C6H6) µg/m^3	Annual*	05	05	- Gas chromatography based continuous analysis - Absorption and Desorption followed by GC analysis
Benzo (a) Pyrene (BaP) – particulate phase only, ng/m3	Annual*	01	01	- Solvent extraction followed by HPLC/GC analysis
Arsenic (As) ng/m^3	Annual*	06	06	AAs/ICP method after sampling on EPM 2000 or equivalent filter paper
Nickel (Nk), ng/m^3	Annual*	20	20	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

* Annual arithmetic mean of minimum of 104 measurements in a year at a particular site, taken twice a week 24 hourly at uniform intervals.

24, 8 or 1 hourly monitoring values, as applicable, shall be complied with 98% of the year. 2% of the time, they may exceed the limits, but not on two consecutive days of monitoring.

Appendix 3
IEE and EIA Format for ADB projects

105. This outline is part of the Safeguard Requirements 1. An environmental assessment report is required for all environment category A and B projects. Its level of detail and comprehensiveness is commensurate with the significance of potential environmental impacts and risks. A typical EIA report contains the following major elements, and an IEE may have a narrower scope depending on the nature of the project. The substantive aspects of this outline will guide the preparation of environmental impact assessment reports, although not necessarily in the order shown.

A. Executive Summary

106. This section describes concisely the critical facts, significant findings, and recommended actions.

B. Policy, Legal, and Administrative Framework

107. This section discusses the national and local legal and institutional framework within which the environmental assessment is carried out. It also identifies project-relevant international environmental agreements to which the country is a party.

C. Description of the Project

108. This section describes the proposed project; its major components; and its geographic, ecological, social, and temporal context, including any associated facility required by and for the project (for example, access roads, power plants, water supply, quarries and borrow pits, and spoil disposal). It normally includes drawings and maps showing the project's layout and components, the project site, and the project's area of influence.

D. Description of the Environment (Baseline Data)

109. This section describes relevant physical, biological, and socioeconomic conditions within the study area. It also looks at current and proposed development activities within the project's area of influence, including those not directly connected to the project. It indicates the accuracy, reliability, and sources of the data.

E. Anticipated Environmental Impacts and Mitigation Measures

110. This section predicts and assesses the project's likely positive and negative direct and indirect impacts to physical, biological, socioeconomic (including occupational health and safety, community health and safety, vulnerable groups and gender issues, and impacts on livelihoods through environmental media [Appendix 2, para. 6]), and physical cultural resources in the project's area of influence, in quantitative terms to the extent possible; identifies mitigation measures and any residual negative impacts that cannot be mitigated; explores opportunities for enhancement; identifies and estimates the extent and quality of available data, key data gaps, and uncertainties associated with predictions and specifies topics that do not require further attention; and examines global, trans-boundary, and cumulative impacts as appropriate.

F. Analysis of Alternatives

111. This section examines alternatives to the proposed project site, technology, design, and operation—including the no project alternative—in terms of their potential environmental suitability under local conditions; and their institutional, training, and monitoring requirements. It also states the basis for selecting the particular project design proposed and, justifies recommended emission levels and approaches to pollution prevention and abatement.

G. Information Disclosure, Consultation, and Participation

112. This section:

(i) describes the process undertaken during project design and preparation for engaging stakeholders, including information disclosure and consultation with affected people and other stakeholders;
(ii) summarizes comments and concerns received from affected people and other stakeholders and how these comments have been addressed in project design and mitigation measures, with special attention paid to the needs and concerns of vulnerable groups, including women, the poor, and Indigenous Peoples; and
(iii) describes the planned information disclosure measures (including the type of information to be disseminated and the method of dissemination) and the process for carrying out consultation with affected people and facilitating their participation during project implementation.

H. Grievance Redress Mechanism

113. This section describes the grievance redress framework (both informal and formal channels), setting out the time frame and mechanisms for resolving complaints about environmental performance.

I. Environmental Management Plan

114. This section deals with the set of mitigation and management measures to be taken during project implementation to avoid, reduce, mitigate, or compensate for adverse environmental impacts (in that order of priority). It may include multiple management plans and actions. It includes the following key components (with the level of detail commensurate with the project's impacts and risks):

1. Mitigation:

(i) identifies and summarizes anticipated significant adverse environmental impacts and risks;
(ii) describes each mitigation measure with technical details, including the type of impact to which it relates and the conditions under which it is required (for instance, continuously or in the event of contingencies), together with designs, equipment descriptions, and operating procedures, as appropriate; and
(iii) provides links to any other mitigation plans (for example, for involuntary resettlement, Indigenous Peoples, or emergency response) required for the project.

2. Monitoring:

(i) describes monitoring measures with technical details, including parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits and definition of thresholds that will signal the need for corrective actions; and

(ii) describes monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures and document the progress and results of mitigation.

3. Implementation arrangements:

(i) specifies the implementation schedule showing phasing and coordination with overall project implementation;

(ii) describes institutional or organizational arrangements, namely, who is responsible for carrying out the mitigation and monitoring measures, which may include one or more of the following additional topics to strengthen environmental management capability: technical assistance programs, training programs, procurement of equipment and supplies related to environmental management and monitoring, and organizational changes; and

(iii) estimates capital and recurrent costs and describes sources of funds for implementing the environmental management plan.

4. Performance indicators:

(i) describes the desired outcomes as measurable events to the extent possible, such as performance indicators, targets, or acceptance criteria that can be tracked over defined time periods.

J. Conclusion and Recommendation

115. This section provides the conclusions drawn from the assessment and provides recommendations.

Appendix 4
Indicative list of possible Impacts at Different Project Stages

DESIGN IMPACT			
Environmental Issue	**Positive Impact**	**Adverse Impact**	**Possible Management Actions**
River system and environmental flows		Increased efficiencies in agriculture and better systems management, resulting in reduced environmental flows	Overall assessment of appropriate water allocation needs for each sector, including environmental flows
Surface and ground water resources	Better agriculture practices may result in improved health of local water bodies. Improved irrigation practices may reduce waterlogging in areas where practiced.	Increased intensification of irrigation could lead to increased waterlogging	Design of appropriate on-farm drainage structures and training WUCS in improved on-farm water management techniques to avoid over-irrigation
Mining and quarrying		Quarrying, borrow and sediment disposal activities could affect local vegetation, biodiversity, cause erosion, dust and noise, and affect communities	Identify specific borrow, quarry and sediment disposal sites, in consultation with relevant authorities and obtain necessary approvals. Contractor to identify borrow site locations as part of technical bid submission. Contractor must provide a plan for site restoration before opening any quarry or disposal site.
Land resources			
Social			

CONSTRUCTION RELATED IMPACTS			
Environmental Issue	**Positive impacts**	**Adverse Impacts**	**Possible mitigation measures**
Physical Environment			
Water resources			
River system and environmental flows		Sand mining resulting in changing of river course and river scouring	Identify appropriate areas for taking river sand, based upon existing regulations, but also ensuring that there is no excess sand taken. Plan mining and procurement sites before starting work to keep in mind any erosion issues that may occur
Wetlands & local water bodies		Dumping of waste in water bodies, contaminating them Washing of vehicles and other activities leading to pollution of water bodies and wetlands	Ensure proper site planning takes place and site management is adequate – to be put into construction contractor's clauses Proper storage and disposal of hazardous material to avoid contamination, spills and accidents. If there are no waste disposal systems in the area, the material should be sent to a pre-identified disposal site. No dumping in river, or labour camps/temporary or material storage sites on river bed. Vehicles properly maintained and serviced – and not washed or serviced, at water bodies/wetlands. Sites restored after work completed. No quarry work in running water of rivers, and minimize need to work or drive through water. Fence off in-stream work to reduce disturbance.
Groundwater		In areas where vehicles are kept, parked or at the quarry site, there may be spills of grease and oil – which could contaminate the groundwater, especially in areas with a high water table Poorly managed sites or waste disposal	Proper storage and disposal of material, including hazardous material, to avoid contamination, spills and accidents. If there are no waste disposal systems in the area, the material should be sent to a pre-identified disposal site. No dumping in river, or labour

CONSTRUCTION RELATED IMPACTS			
Environmental Issue	**Positive impacts**	**Adverse Impacts**	**Possible mitigation measures**
		resulting in waterlogging and a rise in the water table.	camps/temporary or material storage sites on river bed. Vehicles properly maintained and serviced – and not washed or serviced, at site. No driving in river water. Proper waste storage and disposal. Sites restored after work completed. No quarry work in running water of rivers, and minimize need to work in water. Fence off in-stream work to reduce disturbance. Avoid refuelling at project site. For refilling at site, demarcate site, ensure surface made impermeable.
Water quality		Construction activities – like sand mining in river bed will impact the river quality, resulting in localized turbidity to spill of grease and oil from heavy machinery and trucks excavating material Washing vehicles etc in river polluting them	Proper storage and disposal of hazardous material, to avoid contamination, spills and accidents. If there are no waste disposal systems in the area, the material should be sent to a pre-identified disposal site. No dumping in river, or labour camps/temporary or material storage sites on river bed. Vehicles properly maintained and serviced – and not washed or serviced, at site. No driving/washing in river. Sites restored after work completed. No quarry work in running water of rivers, and minimize need to work in water and fence off in-stream work to reduce disturbance. Avoid refuelling at project site. For refilling at site, demarcate site, ensure surface made impermeable.
Atmospheric Parameters			

CONSTRUCTION RELATED IMPACTS			
Environmental Issue	**Positive impacts**	**Adverse Impacts**	**Possible mitigation measures**
Air		potential impacts from vehicular emissions Dust during excavation – at construction sites and sourcing of raw material such as aggregate, sand and murram, and transportation of these materials to construction site Diesel pump sets for provision of energy during construction – leading to air pollution	Use silt fences around excavation and storage for earth, as required. Ensure vehicles carrying earth are covered. Avoid work in high wind condition. As far as possible use already identified roads and routes to access various sites Ensure all equipment is properly maintained Use sprinklers etc to settle dust where needed
Noise		as construction activities requiring machinery will be limited – it is expected that the noise levels may not rise too high.	Ensure all equipment and vehicles are properly maintained Discuss with local population before starting any construction activity to identify possible concerns to ensure minimum disturbance
Land resources			
Soil quality		Localized pollution due to oil and grease spill and waste is likely. Labour camps, for some of the construction activities will create pollution through increased waste or poor management and disposal of waste created due to construction activities	Ensure proper site planning takes place and site management is adequate Rehabilitate site after finishing work, as appropriate Ensure all equipment and vehicles are properly maintained Proper storage and disposal of material, including hazardous material, to avoid contamination, spills and accidents. If there are no waste disposal systems in the area, the material should be sent to a pre-identified disposal site.
Erosion/ compaction		From procurement sites for material – quarries etc, sheet and gully erosion possible Vehicular movement, construction sites and labour sites causing soil compaction	Plan mining and procurement sites before starting work to keep in mind any erosion issues that may occur Rehabilitate all sites after construction/quarrying activities are completed such as ploughing and plantation. Plan site prior to starting excavation activities, including slope stabilization, identify and

CONSTRUCTION RELATED IMPACTS			
Environmental Issue	**Positive impacts**	**Adverse Impacts**	**Possible mitigation measures**
			developing appropriate slope aspect during excavation and contouring to ensure slope stability after earth borrowing activities are completed. Only vegetation that must be cleared for construction purposes or site access should be removed As far as possible use already identified roads and routes to access various sites
Salinty, alkalinity		Poor drainage due to poorly managed construction and labour campsites	Plan site prior to starting excavation activities, including slope stabilization, identify and developing appropriate slope aspect during excavation and contouring to ensure slope stability after earth borrowing activities are completed. Only vegetation that must be cleared for construction purposes or site access must be removed As far as possible use already identified roads and routes to access various sites
Natural and Biological environment			
Terrestrial			
Fauna		Depending upon area for procurement of raw material, location of labour camp, transport routes and other activities disturbance to local avian and other species due to construction noise and human movement possible. Introduction of alien species for plantation activities resulting in loss of habitat Construction in migratory routes at time of migration on inadequate post construction cleaning up of site, could impact species such as the butterfly migration in and	Undertake plantation activities as required, and ensure plantation activities include species that are endemic to the area, in consultation with Forest Department. Rehabilitate all sites after construction/quarrying activities are completed including plantation. Discuss with local population before starting any construction activity to identify possible concerns to ensure minimum disturbance Only take up work in day hours In case of local animal movement or

CONSTRUCTION RELATED IMPACTS			
Environmental Issue	**Positive impacts**	**Adverse Impacts**	**Possible mitigation measures**
		around the Western Ghats Habitat loss due to cutting of trees and other vegetation and plantation of alien species as replacement or for fulfilling local fuel wood needs at the time of construction, which are not appropriate habitat for the local species such as *prosopis glandulosa*	migrations, ensure that work does not take place when the migration is underway, or avoid migratory routes Do not create blockages by storage, labour camps etc in animal corridors Near sensitive areas ensure that work adheres to local regulations and also use least destructive methods, and rehabilitate area after finishing work
Flora		Access to the quarries and borrow pits and clearance of vegetation for removing material	Undertake plantation activities as required, and ensure plantation activities include species that are endemic to the area, in consultation with Forest Department. . Rehabilitate all sites after construction/quarrying activities are completed such as plantation. Discuss with local population before starting any construction activity to identify possible concerns to ensure minimum disturbance Near sensitive areas ensure that work adheres to local regulations and also use least destructive methods, and rehabilitate area after finishing work
Aquatic Habitat		Depending upon the area, there is a possibility of an increased turbidity or disturbance or degradation of the habitat. This could be due to sand quarrying, disposal of waste or washing of vehicles in the area, or even construction of structures in the aquatic system.	Discuss with local population before starting any construction activity to identify possible concerns to ensure minimum disturbance Do not undertake any construction/ quarrying activity during the spawning period of the different fish species. Ensure there is a proper waste management plan in place for all sites Do not wash vehicles in rivers

CONSTRUCTION RELATED IMPACTS			
Environmental Issue	**Positive impacts**	**Adverse Impacts**	**Possible mitigation measures**
Sensitive areas		Depending upon sourcing of material and transportation routes sensitive areas can be impacted due to noise, light, vibrations, and destruction of habitat.	Rehabilitate all sites after construction/quarrying activities are completed including plantation. Discuss with local population before starting any construction activity to identify possible concerns to ensure minimum disturbance Only take up work in day hours In case of local animal movement or migrations, ensure that work does not take place when the migration is underway, or avoid migratory routes Near sensitive areas ensure that work adheres to local regulations and also use least destructive methods, and rehabilitate area after finishing work
Economic and Infrastructure			
Mining and quarrying		Impact from quarries and mines due to reduced water availability and quality, dewatering and change in aquifers or surface water systems	Insure appropriate waste management plan is in place and adhered to. Ensure proper site planning in place and rehabilitation of site after work is over. Ensure appropriate site drainage and sites are rehabilitated
Fisheries		Disturbance to local habitats during construction – such as sand mining from riverbeds. Waste dumping and washing and cleaning of vehicles, machinery etc in water bodies or near them	Do not undertake any construction/ quarrying activity during the spawning period of the different fish species. Plan sites to ensure that there is no, or if this not possible, not excessive river bed mining impacting river flows or fish habitats Ensure waste is not dumped in the river Ensure appropriate waste management at all construction sites
Natural Resource usage and access		There could be some disturbance accessing various sites Labour camps, construction and storage sites. Vehicle parking area	Discuss with local population prior to identifying sites for construction camps etc

CONSTRUCTION RELATED IMPACTS			
Environmental Issue	**Positive impacts**	**Adverse Impacts**	**Possible mitigation measures**
Settlements		Disruptions and disturbance due to labour camps, construction activities and transportation of goods. But this is likely to be temporary	Identify appropriate access routes, speed limits and timings with community. Identify appropriate material storage areas to ensure least possible disturbance. Provide signage, demarcate and cordoning of areas to reduce access to construction site and to avoid accidents. Ensure appropriate site drainage. Restore areas after work is over. Minimize transportation of material through heavily populated areas. Only use road worthy vehicles.
Transport infrastructure		During construction time, there is likely to be higher traffic to and from the various sites – traffic disruptions Poorly identified borrow pits and river sand quarries could lead to a long term damage to both river based and land based infrastructure as landing sites may be disrupted and river courses could shift or lead to erosion downstream, undermining infrastructure on or next to the river Damage to infrastructure due to heavy transport vehicles	Identify appropriate access routes, speed limits and timings with community. Vehicles should take pre-identified routes. Do not allow vehicles to move with loads higher that what they can take. Ensure all sites are rehabilitated once construction or quarrying is over Avoid landing sites, navigation routes for sand quarrying
Waste		Increased waste from labour camps, silt, raw material procurement site, construction waste Malfunctioning vehicles and onsite maintenance Waste from areas dug for infrastructure construction – such as for water flow measurement and lining.	Proper storage and disposal of material, including hazardous material, to avoid contamination, spills and accidents. If there are no waste disposal systems in the area, the material should be sent to a pre-identified disposal site. No dumping in river, or labour camps/temporary or material storage sites on river bed. Vehicles properly maintained and serviced – and not washed or serviced, at site. No driving in river water. Proper waste storage and disposal.

CONSTRUCTION RELATED IMPACTS			
Environmental Issue	**Positive impacts**	**Adverse Impacts**	**Possible mitigation measures**
			Sites restored after work completed. No quarry work in running water of rivers, and minimize need to work in water. Fence off in-stream work to reduce disturbance. Avoid 39refuelling at project site. For refilling at site, demarcate site, ensure surface made impermeable.
Telecommunication		Possible damage to telecommunication lines during construction possible – near material procurement sites and during transportation. Though considering the rural setting, the possibilities are limited and mainly along the small towns such as Maski and Hospet through which either the canal system passes or are on transport routes.	Identify possible telecommunication lines in the area prior to starting work to ensure that they are not damaged due to any construction work. In case of damage repair them immediately
Social			
Population and livelihoods		Disturbance to local population due to construction activity, sites and labour camps	Identify appropriate access routes, speed limits and timings with community. Identify appropriate material storage areas to ensure least possible disturbance. Provide signage, demarcate and cordoning of areas to reduce access to construction site and to avoid accidents. Ensure appropriate site drainage. Restore areas after work is over. Minimize transportation of material through heavily populated areas. Only use road worthy vehicles.
Vector borne diseases		Disruption of drainage, borrow pits and sand mining areas resulting in an increase in vector habitats	Ensure appropriate drainage and waste management at all sites, including sanitation for workers Rehabilitate sites after work is competed
Water borne diseases		May increase if waste management, sanitation and drainage systems for the	Ensure appropriate drainage and waste management at all sites, including sanitation

CONSTRUCTION RELATED IMPACTS			
Environmental Issue	**Positive impacts**	**Adverse Impacts**	**Possible mitigation measures**
		labour camps are not adequately addressed	for workers Rehabilitate sites after work is competed
Health and safety of workers		Possible risk of accidents to workers during construction	Need for emergency procedures in place with first aid available at site. Trained staff to ensure first aid and immediate medical attention is made available till worker reaches hospital Ensure that all safety equipment for workers is available and in place, and workers are trained to use it and are using it Any site which may pose a risk to workers – such as areas where hazardous material are stored must have restricted entry with workers at the facility equipped to handle any accidents, if they may happen All required safety equipment and signage must be in place to ensure that there is a minimum risk of accidents
Archaeological, cultural sites, paleontological sites and aesthetics		This area has a rich cultural heritage and a number of historical places, archaeological sites could be found in the project area. The Vijayanagara empire and other sites that predate it exist. The greatest concern is of the work on the VNC. However, there also exist possibility of chance finds in other project areas Riverbed quarries will impact the aesthetics of the area, through the impact is expected to be low Quarries in hills have an impact on local aesthetics Much of the area consists of hard rock hills especially in the Tunghabhadra area, and forests in the case of the Bhadra. Procurement of material therefore would be an issue that could have an adverse impact on local aesthetics, such as the	In case of chance finding of any archaeological sites, Stop all work that may be underway or planned in the area and discuss with District Commissioner for further action Ensure that the construction company and supervising consultants have an understanding of archaeological concerns in the area Ensure that any important archaeological area is well identified and demarcated and required actions are demarcated in a detailed management and mitigation plan so that no damage takes place to it

CONSTRUCTION RELATED IMPACTS			
Environmental Issue	**Positive impacts**	**Adverse Impacts**	**Possible mitigation measures**
		destruction of the craggy hills for raw material or cutting of trees for use for firewood.	

OPERATION RELATED IMPACTS			
Environmental Issue	**Positive Impact**	**Adverse Impact**	**Possible Mitigation Actions**
Physical Environment			
Water resources			
River system and environmental flows		Increased areas being bought under irrigation resulting in possible return flows no longer reaching the river, adversely impacting environmental flows In areas where some water returns to the river, reuse and higher level of agrochemical with agricultural expansion would result in increased toxics in river system and more aquatic weeds	Through the IWRM plan as identified by the AC_IWRM work towards ensuring that there are sufficient environmental flows in the river and its tributaries Farmers education on proper use and management of agrochemicals, including their waste Ensuring a farmer's friendly method for disposal of agrochemical waste, as identified during project design
Wetlands & local water bodies	Improved agriculture practices resulting in lowering agrochemical usage, reducing contamination reaching waterbody Improved irrigation practices may reduce waterlogging in areas where practiced	Agricultural waste dumped in local water bodies especially agrochemical and their used containers deteriorating local water bodies and their wetland values Increased waterlogging due to poor maintenance of drainage system.	Farmers education on proper use and management of agrochemicals, including their waste Ensuring a farmer's friendly method for disposal of agrochemical waste, as identified during project design Ensure through farmer's education that waste is not disposed in water bodies and appropriate waste disposal systems are found and used
Groundwater	Improved agriculture practices resulting in lowering agrochemical usage, reducing contamination reaching aquifers Improved irrigation practices may reduce waterlogging in areas where practiced, improving aquifer quality	Insufficient funds or management of system – especially drainage management leading to silting up and chocking, resulting in rising water table and waterlogging Poor agricultural practices – such as excessive water used for irrigation leading to rising water table and waterlogging Agrochemical used leaching into groundwater, contaminating aquifers	Farmers education on proper use and management of agrochemicals, including their waste Ensuring a farmer's friendly method for disposal of agrochemical waste, as identified during project design Ensure through farmer's education that waste is not disposed in water bodies and appropriate waste disposal systems are found and used Identify appropriate cleaning and maintenance of drainage system, including disposal of waste removed. Improved agriculture practices – understanding plant needs and use of

OPERATION RELATED IMPACTS			
Environmental Issue	**Positive Impact**	**Adverse Impact**	**Possible Mitigation Actions**
			irrigation water as required through improved understanding of the system Ensure there is a budget for the management of drains and the budget is spent on it
Water quality		Return flows, drainage into canal system (silt and water quality – agrochemicals) deteriorating water quality of both surface and ground water systems	Farmers education on proper use and management of agrochemicals, including their waste Ensuring a farmer's friendly method for disposal of agrochemical waste, as identified during project design Ensure through farmer's education that waste is not disposed in water bodies and appropriate waste disposal systems are found and used
Land resources			
Soil quality	Improved agriculture knowledge resulting in improved soil health	Excessive use of agrochemicals, poor soil and land management practices leading to soil exhaustion, toxicity and degradation, due to poor agricultural extension	Farmers education on proper use and management of agrochemicals, including their waste Ensuring a farmer's friendly method for disposal of agrochemical waste, as identified during project design Identify appropriate soil management and soil testing systems and educate farmers on it. Ensure that farmers remember through repeated information sharing on good agriculture and soil management practices
Erosion/ compaction		Agriculture intensification and poor farmland management resulting in soil erosion	Identify appropriate soil management and soil testing systems and educate farmers on it. Ensure that farmers remember through repeated information sharing on good agriculture and soil management practices
Salinity, alkalinity	Improved soil and water management will ensure soil salinity and alkalinity is	Inadequate extension service to support agricultural expansion resulting in poor	Farmers education on proper use and management of agrochemicals, including

OPERATION RELATED IMPACTS			
Environmental Issue	**Positive Impact**	**Adverse Impact**	**Possible Mitigation Actions**
	reduced/ does not take place	land and irrigation management practices	their waste Ensuring a farmer's friendly method for disposal of agrochemical waste, as identified during project design Identify appropriate cleaning and maintenance of drainage system, including disposal of waste removed. Improved agriculture practices – understanding plant needs and use of irrigation water as required through improved understanding of the system Ensure there is a budget for the management of drains and the budget is spent on it
Terrestrial Flora and Fauna	Reduced toxicity in the environment with better on-farm management practices	Poor management of agriculture waste – especially agri-chemicals and their waste products, contaminates the area and impacts local or migratory species. Potential to expand cultivation areas	WUCS capacity building proper use and management of agrichemicals, including their waste Work with local community to ensure that cultivation is not extended into areas environmental assets Demarcate all areas though an IWRM plan for conservation and limitation of areas for agriculture. Identify important wetlands and monitor land use and condition Through the IWRM activities identify appropriate land management and conservation methods, and work with farmers to educate and ensure that wetlands are not degraded
Aquatic flora and fauna	Improved irrigation, agriculture and on-farm practices resulting in improved aquatic habitats and reduced proliferation of aquatic weeds	Agrichemical waste and increased toxicity of the local aquatic environment	Work through a community system to identify wetlands, other habitats and local environmental assets Work with local community to ensure that cultivation is not extended into areas environmental assets Educate community on management of soil and agrichemical usage **Demarcate all areas though an IWRM plan**

OPERATION RELATED IMPACTS			
Environmental Issue	**Positive Impact**	**Adverse Impact**	**Possible Mitigation Actions**
			for conservation and limitation of areas for agriculture.
Sensitive areas		Agriculture intensification, irrigation intensification and use of new species may have an impact on area of influence of sensitive area	Through the IWRM activities identify appropriate land management and conservation methods, and work with farmers to educate and ensure wetlands and other conservation areas are not degraded Work with farmers to identify appropriate land management systems at the village level Farmers education on proper use and management of agriculture and agrochemicals, including their waste Ensuring a farmer's friendly method for disposal of agrochemical waste, as identified during project design
Economic and Infrastructure			
Agriculture	Improvement in yields and productivity with improved agriculture extension/agricultural practices, more reliable irrigation availability and reduced waterlogging.	In areas where water is now available due to saving in other areas, poor drainage may result in water logging decreased agricultural productivity.	Identify appropriate cleaning and maintenance of drainage system, including disposal of waste removed. Improved agriculture practices – understanding plant needs and use of irrigation water as required through improved understanding of the system
Fisheries	Improved on-farm practices resulting in better fisheries	Expansion of agriculture into wetlands and water bodies by draining them Agrochemical and other waste dumping degrading water quality	Through the IWRM activities identify appropriate land management and conservation methods, and work with farmers to educate and ensure that wetlands are not drained Work with farmers to identify appropriate land management systems at the village level Farmers education on proper use and management of agriculture and agrochemicals, including their waste Ensuring a farmer's friendly method for

OPERATION RELATED IMPACTS			
Environmental Issue	**Positive Impact**	**Adverse Impact**	**Possible Mitigation Actions**
			disposal of agrochemical waste, as identified during project design
Waste		Silt management – desilting, other waste, disposal sites Increased weeds in water bodies due to eutrophication resulting in increased need for disposal of weeds	Identify appropriate waste management system for drain cleaning Weeds can be used, in consultation with farmers, for manure. Therefore, if farmers are interested a system for their use and disposal on farmlands at the time that drains are cleaned should be undertaken Ensure appropriate drainage management to keep the area silt free and not allowing the disposal of any waste Work with farmers through farmer's education system to ensure appropriate application of agrochemicals, including fertilizers Educate farmers on proper soil management and testing
Social			
Population and livelihoods	Overall improvement in livelihood opportunities due to increased productivity and improved information on agriculture		
Vector borne diseases		Poor waste management – dumping of waste in natural drainage systems, or those developed for draining excess water from project area increasing vector habitats Poor drainage management resulting in silting chocking and weed growth in water bodies	Farmers education on proper use and management of agrochemicals, including their waste Ensuring a farmer's friendly method for disposal of agriculture, agrochemical and other waste, as identified during project design Identify appropriate cleaning and maintenance of drainage system, including disposal of waste removed

OPERATION RELATED IMPACTS			
Environmental Issue	**Positive Impact**	**Adverse Impact**	**Possible Mitigation Actions**
			Identify appropriate cleaning and maintenance of drainage system, including disposal of waste removed. Improved agriculture practices – understanding plant needs and use of irrigation water as required through improved understanding of the system
Water borne diseases		Poor drainage and waste management	Farmers education on proper use and management of agrochemicals, including their waste Ensuring a farmer's friendly method for disposal of agriculture, agrochemical and other waste, as identified during project design Identify appropriate cleaning and maintenance of drainage system, including disposal of waste removed Identify appropriate cleaning and maintenance of drainage system, including disposal of waste removed. Improved agriculture practices – understanding plant needs and use of irrigation water as required through improved understanding of the system
Nutrition and other health problems		Toxicity and other health risks due to use of agrochemicals without adequate protection Reuse of agrochemical packages for food and other storage purposes Burning of agrochemical plastic packaging Increased agro-industry waste disposal without adequate treatment and management resulting in contamination of land and water in the area, impacting health	Farmers education on proper use and management of agrochemicals, including their waste Ensuring a farmer's friendly method for disposal of agriculture, agrochemical and other waste, as identified during project design

Appendix 5
Indicative costs for Monitoring

116. Given below are suggested monitoring actions for the subprojects. These can be adjusted according to required subproject design and therefore monitoring needs.

117. Prior to developing a monitoring plan there is a need for the development of a baseline for some activities. This would help with the monitoring activities. The baseline is described below along with monitoring needs and responsibilities.

Table 5.1 Proposed Environmental Monitoring Works For the work Main Canal (up to Rs.5 crores)

S.No	Item to be Monitored	Total Number of Samples proposed	Frequency	Average Minimum Unit Cost per sample (Rs)	Total Cost in (Rs)
1	Ground water As per 10500:1991 including pesticide residue analysis (DDT, Endosulphan,phorate, carbofuran, and monocrotophos etc) Total of 34 parameters including 4 of pesticides (Tube wells adjacent to canal(preferably from the newly drilled tube wells under the project)	16 (2 locations * 8 times) in the sub-basin	Once in every 6 months 2 samples every time 2 *4*2 = 16 (during operations-baseline to be established at start of project)	8300	1,32,800
2	Surface water quality- Physico, chemical, bacteriological parameters and pesticide residue analysis (DDT, Endosulphan, phorate, carbofuran, and monocrotophos etc., Total 34 parameters plus extra BOD, COD and DO) (Dam and Canal water)	16(2locations * 8 times) in the sub-basin	Once in every 6 months 2 samples every time 2 *4*2 = 16 (during operations)	9400	1,50,400
3	Silt- physical, heavy metals and pesticide residue Total 27 parameters including 4 pesticide residue (Dam and Canal)	8 (2 locations * 4)	During construction (only TSS, BOD and DO twice a year) Twice in a year (i.e. Between April to May and Sept to Nov 2 samples every time 2 *2*2 = 8	12,100	96,800
4	Soil- phyiso- chemical, micro and macro nutrients and pesticide residue Total 27 parameters including 4 pesticide residue (Soils from canal Adjacent fields preferably water logged areas)	8 (2 locations * 4)	Twice in a year (i.e. Between April to May and Sept to Nov 2 samples every time 2 *2*2 = 8 (baseline at start of	12,100	96800

S.No	Item to be Monitored	Total Number of Samples proposed	Frequency	Average Minimum Unit Cost per sample (Rs)	Total Cost in (Rs)
			construction and remainder during operations)		
	Total cost				**476800**

Table 5.4 Proposed Environmental Monitoring Works For the work Minors & Sub-minors (above Rs. 5 crores)

S.No	Item to be Monitored	Total Number of Samples proposed	Frequency	Average Minimum Unit Cost per sample (Rs)	Total Cost in (Rs)
1	Ground water As per 10500:1991 including pesticide residue analysis (DDT, Endosulphan,phorate, carbofuran, and monocrotophos) Total of 34 parameters including 4 of pesticides (Tube wells adjacent to canal(preferably from the newly drilled tube wells under the project)	12 (3 locations * 4 times)	Once in every 3 months 3 samples every time3 *4*1 = 12 (during operations- baseline to be established at start of project))	8300	99,600
2	Surface water quality- Physico, chemical, bacteriological parameters and pesticide residue analysis (DDT, Endosulphan,phorate, carbofuran, and monocrotophos Total 34 parameters plus extra BOD, COD and DO) (Dam and Canal water)	12(3 locations * 4times	Once in every 3 months 2 samples every time 3 *4*1 = 12 (during operations- baseline to be established at start of project)	9400	1,12,800
3	Silt- physical, metals and pesticide residue Total 27 parameters including 4 pesticide residue (Dam and Canal)	6 (3 locations * 2)	During construction (only TSS, BOD and DO twice a year) Twice in a year (i.e. Between April to May and Sept to Nov 2 samples every time3 *2*1 = 6 (during operations- baseline to be established at start of project)	12,100	72,600
4	Soil- phyiso- chemical, micro and macro nutrients and pesticide residue Total 27 parameters including 4 pesticide residue (Soils from canal Adjacent fields preferably water logged areas)	6 (6 locations * 2)	Twice in a year (i.e. Between April to May and Sept to No2 samples every time 3 *2*1 = 6 (during operations- baseline to be established at start of project)	12,100	72,600
	Total Cost				**3,57,600**

Appendix 6
Consultation format

Serial No	Date	Place	Topic & issues raised	Outcomes	Broad support obtained? Y/N (Annexure-List of Participants)	Total Participants	Stakeholder Group (Number Involved in the Consultation)						
							State Govt	Villagers llagers	Local Govt/ Gram Panchayat/ WUCs /anganwadi	SOE (KNNL, CADA)	CSO	Female	Consultants