

A REVIEW OF WATER MANAGEMENT, WATERSHED DEVELOPMENT AND FORESTRY POLICY IN INDIA

Internal Report I

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1. ABBREVIATIONS & ACRONYMS

APRLP	Andhra Pradesh Rural Livelihoods Programme
CAPART	Council for Advancement of People's Action and Rural Technology
CAT	Catchment Area Treatment
CGIAR	Consultative Group on International Agricultural Research
CRES	Centre for Natural Resources Management
DAC	Department of Agriculture and Cooperation
DARE	Department of Agricultural Research and Education
DDP	Desert Development Programme
DPAP	Drought Prone Areas Programme
DST	Department of Science and Technology
EAPs	Externally Aided Projects
EAS	Employment Assurance Scheme
EIA	Environmental Impact Assessment
EPA	Environmental Protection Act
FRP	Forest Research Programme
FPR	Soil and Water Conservation in the Catchments of Flood Prone Rivers
GEO	Global Environment Outlook
GoI	Government of India
HP	Himachal Pradesh
IAEPS	Integrated Afforestation and Eco-development Projects Scheme
ICAR	Indian Council for Agricultural Research
IIT	Indian Institute of Technology, Delhi
IWRM	Integrated Water Resource Management
IWDP	Integrated Wasteland Development Programme
IPS	Investment Promotional Scheme
JFM	Joint Forest Management
KAWAD	Karnataka Watershed Development Project
MANAGE	National Institute for Agricultural Development and Management
MoA	Ministry of Agriculture
MoEF	Ministry of Environment and Forests
MoRD	Ministry of Rural Development
MoWR	Ministry of Water Resources
MP	Madhya Pradesh
NIRD	National Institute of Rural Development
NLCB	National Land Use and Conservation Board
NRDMS	National Resources and Data Management System
NWDPRA	National Watershed Development Programme for Rainfed Areas
NWDB	National Wasteland Development Board

NWRC	National Water Resources Council	
RGWM	Rajiv Gandhi Watershed Mission	
RVP	Soil and Water Conservation in the Catchments of River Valley Projects	1
SLUB	State Land Use Boards	
TAG	Technical Advisory Group	
TDET	Technology, Development and Extension	
UNDP	United Nations Development Programme	
WDPSCA	Watershed Development Project in Shifting Cultivation Areas	
WSD	Watershed Development	

2. PREFACE

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This report is a project output from 'Low Flows and Livelihoods in India' (R8171), one of three projects within a cluster of projects coordinated by the 'FLOWS' Unit. This unit managed by the Centre for Land and Water Resources Research, University of Newcastle, UK was commissioned by the Department for International Development, Forestry Research Programme to co-ordinate a group of projects which focus on the impacts of forests on water quality and quantity.

The FLOWS cluster aims to alleviate poverty by developing policies which improve water resources and catchment goods and services. The research centre's ethos is focused on increasing understanding of forest and water impacts through biophysical and socio-economic research. This approach brings together 'science' and 'public' perceptions (connects science with policy) as a means to improve people's livelihoods.

3. INTRODUCTION

The objective of this review is to present an initial assessment of the current land and watershed policies, strategies and related land and water problems in India. This will provide the basis for recommending changes in policy and developing a strategy for policy implementation, developed through the course of the project: 'Low Flows and Livelihoods in India', for the Government of India (GoI), donor agencies, and related NGOs linked to watershed development (WSD) programmes and land/water resource issues.

There are three generic areas of policy focus within the project: water, WSD and forestry. This document seeks to illustrate and suggest gaps in these areas related to the equitable allocation of water, broadly grouped into three main areas of concern¹:

- 1. The lack of a framework to evaluate water resources at the level of WSD projects and of mechanisms which scale up to the catchment/basin level.**
- 2. Deficient departmental (and sectoral) coordination affecting water/land use allocation.**
- 3. Policies based on incorrect assumptions about land use/water connection, particularly regarding forest hydrology.**

It is expected that this study will provide the basis for an effective contribution to evidence-based policy making, effective policy partnerships and the implementation of policy change with key stakeholders in India.

Rights and access to water, particularly in areas where rainfall is low or erratic, is becoming a major political issue and one vital to national interests (FAO, 1995). The Scientific Committee on Problems of the Environment (SCOPE) survey for GEO-2000 (Global Environment Outlook) a global environmental assessment process, that is cross-sectoral and participatory, cited climate change and the quantity and quality of water resources as the main issues that currently do not receive enough *policy attention* (UNEP 2000).

Water is pivotal in supporting and sustaining livelihoods. It is for this reason that the United Nations Development Programme (UNDP) water strategy consists of two main goals: to halve the number of people without access to safe drinking water and basic safe sanitation by 2015 and to stop the unsustainable exploitation of water resources by developing water management strategies at the regional, national and local levels which promote both equitable access and adequate supplies (UNDP, 2002). Region-specific studies, undertaken for the GEO-2000, to investigate possible alternative policies for a sustainable future showed that the knowledge and technical base to solve environmental issues is available, and that if these alternative policies are implemented immediately, and with vigour, a sustainable course of action would be set in motion (UNEP, 2000).

India shares about 16% of the global population but it has only 4% of the world's total water resource (GoI Planning Commission, 2001). The estimated rate of groundwater extraction in the 1990s, exceeding the replenishment rate has been calculated at 104 billion m³yr⁻¹ compared to 30 billion m³yr⁻¹ in China and 10 billion m³yr⁻¹ in northern Africa (Postel, 2000). Currently over 10% of blocks classified by the Central Ground Water Board have been identified as being over-exploited and blocks¹ where exploitation is beyond the critical level have been increasing at a rate of 5.5% each year (World Bank, 1999). Whilst moves by the GoI since 1995 have been made towards creating common guidelines in the form of a framework for watershed development, there are concerns that legislative measures in place to protect and manage India's water resources are hindered by the lack of political and local awareness in water and land resources management, and in some cases are based upon ingrained and incorrect scientific

¹ Blocks are defined as the smallest administrative unit for water resource management in India.

understanding of water resource management and land use (Singh and Singh, 2002 and Gosain and Calder, 2003).

The project 'Low Base Flows and Livelihoods in India' seeks to highlight the importance of taking into account both supply and demand issues in land and water policy formulation and implementation, and improving departmental co-ordination between the main policy actors by developing a framework for monitoring and evaluation. The project is focussed on the interface of forestry and watershed policies in India with particular attention to the states: Himachal Pradesh and Madhya Pradesh. This report provides an introduction to the policy issues that will be addressed during the development of the project.

4. CURRENT POLICY FRAMEWORK IN WATER & LAND MANAGEMENT

4.1 Institutions Involved with Land and Water Issues

The National Water Resources Council (NWRC), the apex policy making body for water resources development in India, formulated the 1987 and 2002 National Water Policies. These policies were placed before parliament, then circulated to the central ministries and states for implementation. Progress in implementation of the acts is reviewed by the National Water Board, constituted solely for this purpose. Water is regarded as a state subject and the administrative control and responsibility for water development rests with the various State Departments and Co-operations.

Progressive steps have been made since the Rio and Dublin (1992) conferences in dealing with water and the environment in the endeavour to apply the principles of integrated water resource management (IWRM). The United Nations Millennium Declaration and Year of Freshwater 2003 have further hastened innovative projects from international organisations, government and private businesses to tackle the urgent problem in India of both high water demand and water scarcity. The CGIAR Challenge Programme on Water and Food has benchmarked the Indus-Gangetic Basin for the development of integrated catchment management due to concerns of over exploitation of ground water, declining water tables, high levels of poverty and its 'high potential-low productivity' status (CGIAR, 2002).

The National Water Policy 2002 recognises that water resource development should be planned for in hydrological units, or watersheds. By taking into account multi-sectoral factors such as ground water, surface water and other environmental considerations it is proposed that sustainability in the quality and quantity of water resources can be achieved. However the many unresolved land and water issues make the land water interface a tenuous political arena.

Whilst there is no national legislation for land policy, land is also regarded as a state subject. Formally, guidelines for planning and management of land resources should be discussed between the State Land Use Boards (SLUB), the National Land Use and Conservation Board (NLUB) and the National Wasteland and Development Board (NWDB). However, it is recognised that there is a pressing need to revitalize these organisations to serve their original purpose of promoting integrated land-use planning (GOI Planning Commission, 2001). Land policy is also indirectly and subtly conveyed through other policies such as the National Water Policy 2002 and the Watershed Programmes. There are currently no national policies in place which broach water demand management through any of these institutions.

WSD in India has been managed by three central ministries: the Ministry of Agriculture (MoA), the Ministry of Rural Development (MoRD) and the Ministry of Environment and Forest (MoEF) (Panchayati Raj and Natural Resources Management, 2000). The Planning Commission of India, which is in charge of the development of Five-year Plans for the effective and balanced utilisation of the country's resources, co-ordinates long-term policy development in this area. The Commission is separated into Divisions which establish sector-wise Working Groups to make recommendations on policy matters for the formulation of the Five-Year Plan. The WSD group is in the Agriculture Division. There is also a Water Resources Division and an Environment and Forestry Division.

Indian planning now has an emphasis on decentralised local planning. After reform in 1993 there are now District Panchayats, Block Panchayats and Village Panchayats below the state level. The most significant development is that Panchayats have been assigned a wide range of functions with respect to the preparation of plans and implementation of schemes for economic development and social justice. Some of these functions include agriculture, land improvement and soil conservation, minor irrigation and water management, social forestry and farm forestry. The role of the Panchayats in WSD is still contested but it is recognised that they should be the primary implementing agency of watershed planning and action.

The Department of Science and Technology (DST) of the Ministry of Science and Technology and the Ministry of Information Technology provide science and technology inputs to the different ministries involved in land and water management. In particular, the Natural Resource Data Management Systems (NRDMS) programme of the DST is working to develop methodologies and technological tools to enable local bodies to prepare and implement plans. The outputs of this R&D programme should contribute to the capacity building of the national watershed management programmes and make a contribution in formulating national policy for watershed management.

4.2 Watershed Development Programmes

The MoA, MoRD and the MoEF along with their respective line departments in the Indian states, are the three main government ministries in charge of watershed protection and development. Each programme focuses on different aspects and activities within the ministries WSD criteria (Figure 1).

The MoA has worked in WSD since the 1960s and deals with issues including: erosion prone agricultural lands, optimizing production in rainfed areas and reclaiming degraded lands. The Department of Agriculture and Cooperation (DAC) and the Department of Agricultural Research and Education (DARE) of MoA are involved in all aspects of watershed development. They are supported by two autonomous bodies: the Indian Council for Agricultural Research (ICAR), and National Institute for Agricultural Extension and Management (MANAGE). The MoA is currently implementing several schemes/programmes including the National WSD Project for Rainfed Areas (NWDPR), Soil and Water Conservation in the Catchments of River Valley Projects (RVP) and Flood Prone Rivers (FRP), Reclamation of Alkali Soils, WSD Project in Shifting Cultivation Areas (WDPSCA) and Externally Aided Projects (EAPs).

The MoRD has been implementing watershed projects only since the late 1980s. It deals with non-forest wastelands and poverty alleviation programmes with important components of soil and water conservation. The key department in MoRD is the Department of Land Resources particularly the Wastelands Development Division. There are however two other departments, the Department of Drinking Water Supply and Department of Rural Development also involved in WSD activities.

Two organisations support the MoRD: the National Institute of Rural Development (NIRD) and the Council for Advancement of People's Action and Rural Technology (CAPART). The former provides advice on policy matters about watersheds, through the Centre for Natural Resources Management (CRES), whilst CAPART deals with the voluntary sector. CAPART also has a division which sanctions watershed projects to NGOs and voluntary organisations. Programmes implemented by MoRD include the Drought Prone Areas Programme (DPAP), Desert Development Programme (DDP), Integrated Wastelands Development Programme (IWDP), on-going watershed projects under the Employment Assurance Scheme (EAS), Technology, Development, Extension and Training (TDET), Investment Promotional Scheme (IPS), Support to NGOs, the small Wastelands Development Task Force Scheme in MP and some Externally Aided Projects (EAPs).

The MoEF is one of the ministries dealing with forest and wasteland issues. Since 1989 the ministry implemented the Integrated Afforestation and Eco-development Projects Scheme (IAEPS) with the intention of promoting afforestation and the development of degraded forests within an integrated watershed approach. WSD projects, until 1995 were officially co-ordinated by multi-sectoral programmes with (differing objectives) launched by the GoI. After review in 1999 by the MoRD and the MoA a common set of operational guidelines, objectives, strategies and expenditure norms were established for WSD programmes in 2001. These are implemented through programmes such as DPAP, DDP and IWDP (overseen by the Department of Land Resources). The guidelines encourage the active involvement of non-

governmental organisations, semi-governmental institutions and private enterprises, universities and training institutions. However concerns are rising that emphasis in WSD programmes is still firmly based on the belief that water is an infinite resource due to the continuing development of ground water abstraction and water harvesting techniques (KAWAD, 2001).

Legislation promoting state adaptation of the programmes and the involvement of outside parties and autonomous agencies has lead to a myriad of WSD programmes and research initiatives at the state and district level. The difficulties in disseminating knowledge, experience, scientifically validated information and methodologies is made worse by the lack of any common framework between states and departments for the implementation of, and dissemination in watershed development. This is accentuated further by the lack of a common set of agreed strategies for IWRM in WSD programmes which are based upon validated scientific knowledge.

Madhya Pradesh has a multitude of watershed programmes including NWDPPA jointly lead by the Agricultural Department and the Water Resources Department. After implementation of the 1994 guidelines Madhya Pradesh witnessed the country's largest watershed programme, the Rajiv Watershed Mission (RGWM) (Panchayat Raj and Natural Resources Management, 2002). The Missions activities are overseen by the Empowered Committee, whilst a Technical Advisory Group (TAG) under the Empowered Committee provides necessary technical inputs into the RGWM. The TAG plays the role of co-ordination amongst departments. The Chief Minister is the sole political functionary associated with oversight of the programme. Conversely, within Himachal Pradesh several departments deal with aspects of water quantity and quality whilst only the Department for Rural Development is involved in the implementation of an IWDP upon a WSD basis.

Looseness in departmental co-ordination is again reflected at the national level by the Working Group of the Planning Commission. The recommendation of a mechanism to avoid the overlap in the activities of the three major ministries MoRD, MoA and MoEF through compartmentalising functions has further increased the divisions within watershed management. The group has recommended a 25 year Perspective Plan to treat/reclaim/cover 88.5 m.ha of rainfed degraded lands with cost-sharing by the Centre (GoI), the states and the beneficiaries. The Perspective Plan presupposes that each of these ministries has a definite niche area based upon their role in past watershed programmes.

The MoEF is expected to take control of forested areas, whereas the MoRD should keep control of any of the schemes such as DPAP, DDP, IWDP previously started by this ministry. Similarly, it is recommended that the MoA should concentrate on watersheds containing 'panchayat' (village council) through schemes like NWDPPA. It should be understood that this approach of compartmentalizing the functioning of various players is the exact opposite to the integrated approach that the country claims to follow.

Integrated watershed management does not merely imply the amalgamation of different activities to be undertaken within a hydrological unit. It also requires the collation of relevant information so as to evaluate the cause and effect of all the proposed actions. The watershed is the smallest unit where the evaluation of man induced impacts upon natural resources becomes possible. Therefore although the 'panchayat' remains the preferred implementation unit, the watershed should be the evaluation unit used in assessing impacts.

As the impacts resulting from actions taken at the 'panchayat/watershed' level will be experienced at a higher level within the drainage basin, the assessment of these impacts will require the availability of a framework which enables the mapping of such units and their entities and the interconnections at the Panchayat level and at the higher catchment level. Such a framework will need regular maintenance and updating to reflect fully the most accurate ground truthed data or the infrastructure requirements for planning and management of the natural resources collected by the relevant departments. This framework, once available,

could be used by all the line departments and updated by the relevant departments, which have designated areas of jurisdiction over the data entry. The format should be made consistent with local to state and national level structures as well as the corresponding watershed, sub-basin and basin level structures

5. FORESTS & WATER: THE POLICY CONTEXT

It is being increasingly recognized that policy making must be underpinned by validated scientific knowledge. The linkage between land use and water resources has conventionally been based more on perceived wisdom (myth) rather than science-established reality. A significant proportion of the conventional wisdom surrounding land use has revolved around the links between trees/forests and water. This section will analyze the major policies and guidelines in India related to watershed development, forests and water in order to understand implicit assumptions regarding forest-water linkage.

The increasing emphasis on WSD in India in the last two decades, which seeks to integrate land and water management, is a direct result of the realization that the natural resource base of the country (land, water and forests) is facing severe degradation due to pressures of population and economic development. This degradation is clearly visible in the form of increased soil erosion, declining land productivity, declining groundwater tables, reduction in quality and quantity of drinking water and loss of forest cover. Furthermore, frequent occurrences of floods and droughts are given as further evidence of improper land use in catchments (MoA 2002). The primary focus of watershed protection and development in India, to date has mainly concentrated on reversing the negative impact of land degradation on the rural poor at the local level rather than at a wider macro scale (Kerr & Chung 2001). Further, there has been very little interface at the policy level at the national and state level between forestry and watershed development.

Historically, ever since the breakdown of traditional resource management systems took place in the colonial times (Guha 1991, Gadgil & Guha 1992), regulation has been the main approach followed for natural resource management in India. Management of land, water and forests has been undertaken in a top-down, centralized manner with little or no involvement of local communities with a stake in these resources. Further, there has been no integrated approach in the management of these resources, fragmented across several government agencies, ministries and line departments.

The Forest Department plays a crucial role in watershed protection and development. Firstly, by protecting forests in upper catchment areas and secondly, by undertaking soil and water conservation and WSD works on degraded forest lands, as part of its regular ongoing forestry activities.

The Forest Department is the sole department responsible for maintaining and managing approximately 76 million hectares of legally classified forest land in India i.e. about 23% of the country's total geographical area (FSI, 1999, MoEF, 2002). Despite the lack of adequate scientific evidence regarding the linkage between forests and water, the perception that forests provide several watershed services in the form of greater availability of water, lesser soil erosion, more rainfall, flood and landslide control is widespread in the minds of most people, across all departments and at all levels, in the country. Nonetheless, traditionally there has been little or no coordination between the Forest Department and the line departments such as Rural Development and Agriculture. Each has tended to work on a particular category of land, despite the general perception of the linkages between forests, other land uses and water.

Recognizing the limitations of this fragmented and regulatory approach in halting the degradation of natural resources, a set of 'Guidelines for Watershed Development' (Figure 2) were drawn up in the mid nineties based on the recommendations of the Hanumantha Rao Committee, which was set up to review WSD programmes in the country. These Guidelines advocated a radical shift towards more participatory approaches as well as making a case for WSD to be undertaken in a more holistic manner following a ridge to valley approach. Unlike earlier approaches where the revenue or administrative boundary was adopted as the unit for development purposes, under the participatory WSD programmes today, the entire watershed is chosen as the appropriate unit area for development. This new approach seeks to improve and develop all types of lands - revenue, forest, community and private lands - that fall within a particular watershed.

While the focus of the 2001 watershed guidelines issued by various ministries still differs somewhat in relation to their specific areas of interest, the common chord that underpins all of them today is their uniform and unambiguous commitment to undertake land and water management in an integrated manner using community-based participatory approaches. This new approach is based on the explicit assumption of perceived wisdom that there exist concrete and definite linkages between the conservation and treatment of forests and other land cover and water augmentation. This understanding is reflected in the current policy scenario both at the national and state levels.

Over the last decade, a number of policies and guidelines have guided the shift in natural resource management and watershed development, from a *regulatory* to a more community-based *participatory* approach. Specifically from the point of view of providing watershed protection services, the National Forest Policy (1988) has laid particular stress on the maintenance of environmental stability and on arresting soil erosion and denudation in the catchment areas. The forest policy is based on the assumption that planting trees helps in improving water flows. A number of benefits of trees and forests are listed *viz.* soil and moisture conservation, mitigation of floods and droughts, retardation of siltation of reservoirs, prevention of desertification and improvement in the microclimate. The policy sets an ambitious national goal of bringing one-third of the total land area under forest or tree cover. The target for the hills and mountainous regions is much higher at two-thirds of total land area. However, no scientific basis for the above targets is provided.

Further, through the Joint Forest Management (JFM) guidelines of 1990 and the National Afforestation Programme launched in 2002, the MoEF has strongly encouraged afforestation and forest protection in denuded areas through people's participation and micro-planning (Figure 3), in a way that not only meets the needs of the local communities but also fosters watershed and ecosystem stability at a larger scale. The regulatory framework with respect to watershed protection is also very elaborate. It contains several regulations to safeguard watershed areas with large forest coverage. Of the various acts and notifications, the Environmental Protection Act (EPA), 1986 and the Environmental Impact Assessment (EIA) notification, 1994 are especially relevant as they make the EIA clearance and Catchment Area Treatment (CAT) mandatory for all major development projects. Also, wherever such projects involve diversion of forest-land, the Forest Conservation Act, 1980 comes into force which has provisions for mandatory compensatory afforestation in case of diversion of any forest land for non-forest purposes.

The common MoRD WSD guidelines also encourage undertaking afforestation activities, thereby highlighting the positive role of woody vegetation in providing watershed protection services. Further, whenever forest-lands fall within the watershed areas selected for treatment under the Common Guidelines, the Guidelines recommend its inclusion in the watershed treatment plan and call on the concerned forest officer to grant sanction for the treatment plan of that particular forest area. The guidelines even mandate the JFM committees existing in those areas to undertake the watershed implementation work, and recommend the setting up of such committees, if none exist. However, unlike the MoRD, no similar initiative exists in the MoA yet and the Planning Commission acknowledges that this is one area where the complementarities between forests and agriculture need to be strengthened further so that local communities can develop a stake in the preservation of forests (GoI Planning Commission, 2002). None of these recommendations are again backed by any scientific analysis of the envisaged benefits.

Apart from the policies and guidelines of the MoEF, MoRD, and the MoA, the National Water Policies issued by the Ministry of Water Resources (MoWR) in 1987 and 2002 (Figure 4) also recognise the role of forests in providing watershed protection services. The 1987 policy calls for the preservation and increase of forest cover to reduce the intensity of floods. Similarly the role of forests in mitigating droughts is acknowledged in the policy, clearly articulated in the belief that pastures, forestry and other modes of development which are relatively less water demanding should be encouraged. Very few changes can be found in the general thrust and

thinking in the new National Water Policy of 2002 from that expressed in 1987. The need for water resources planning at a drainage basin level or sub-basin level is emphasized along with a strong focus on watershed management through extensive soil conservation, catchment area treatment, preservation of forests and increase in forest cover.

The latest development in watershed policy is the constitution of a Working Group on "Watershed Development, Rainfed Farming and Natural Resources Management" by the Planning Commission, Government of India, to review the various ongoing schemes and projects in the sphere of natural resource management, particularly the programmes based on the WSD approach under the MoA, MoRD and MoEF. The Working Group has submitted a review report with a set of recommendations consisting of a broad framework and guiding principles in this sector for the formulation of the Tenth Five Year Plan (2002-07).

The spirit of the National Water Policy has been imbibed in state / draft state water policies as well. For instance, the Draft State Water Policy formulated recently by Himachal Pradesh clearly states the need for preservation of forests and increasing the forest cover to conserve water in the catchment. In its strategy to make drought prone areas less vulnerable to drought, the policy assumes forests and pastures are less water demanding, and thereby encourage their development. The draft policy also advocates a closer integration of water-use and land-use policies.

Similarly, the Draft State Water Policy of Madhya Pradesh also suggests forest protection and increase in forest area to combat floods as well droughts. The implicit assumption being that afforestation will mitigate both floods and droughts. In fact, the policy strongly recommends supply of water at concessional rates for undertaking afforestation. Madhya Pradesh also has the largest WSD programme in the country *viz.* the Rajiv Gandhi Watershed Mission (RGWM), which was launched in 1994. Afforestation is a key activity under this project and usually a Forest Department functionary is involved as a member of the WSD Team.

6. CRITICAL ISSUES IN WATERSHED PROJECTS: MYTHS, SUPPLY & DEMAND

'Policies and practices are needed that are based on accurate information, that seek long-term solutions and that have strong emphasis on promoting the management of water resources at all levels' (Batchelor *et al* 2003)

A key question in WSD is 'What makes a Watershed project successful?' Few conclusions from water resources research focus on constructive criticism and the presentation of specific recommendations for action. Instead localised micro-regional successes are applauded or further areas of research implied. It is also suggested that the disparity between the science and public perceptions need to be addressed before we are in a position to devise and develop land and water policies, which are aimed at either improving the water environment, and by doing so improving the livelihoods of poor people by greater access to water, or conserving and protecting the forests (Calder *et al* 2003).

Semi-arid regions of India often receive less than 500mm^{yr}-1. Unsurprisingly water is a highly valuable resource to farmers. It is easy therefore for any watershed projects to fall into the trap of being a 'developer of new sources of water' (KAWAD 2001), when the main issue is of demand, not supply. The main conclusions from the Karnataka Watershed Development Society and Andhra Pradesh Rural Livelihoods Project water resources audit highlight the damaging affect of current water resource management in southern India (KAWAD, 2001). It is suggested from the audit that;

1. A major shift in emphasis is needed from the development of water resources to improving the management of the resource.
2. Certain areas will be hit by severe drought unless steps are taken to re-establish ground water reserves particularly in aquifers (that provide an important source of domestic water)

And importantly,

3. Hard political decisions will have to be made as to the wisest use of a limited resource

Kakade *et al* (in progress), further reiterated the problems of water scarcity in India through anthropogenic causes such as the overexploitation of ground water, absence of recharge measures and the emphasis by the GoI on relief measures rather than long term solutions. The message of tackling demand, not supply is again repeated in recommendations by BAIF Development Research Foundation, a professional multi-disciplinary team devoted to rural development based in Maharashtra, India. Key conclusions from their study of watershed programmes in five Indian states included (Kakade *et al*, 2002):

1. *Despite the integrated approach and focus on developing community institutions there were no examples of demand management being promoted.*
2. *User groups were established in all cases to manage new assets such as check dams; however these did not extend to the management of ground water.*
3. *There was little or no social or legal control over the use of most water resources in all watersheds.*

The problem of fitting facts to theory, when the theory may be wrong, is a strong base for the diversity of viewpoints with regard to ecological cause and effect models (Saberwal, 1997). Consequently damaging decision making will continue to occur when trying to protect both

the resource and the resource dependent peoples unless this issue is resolved and the conventional wisdoms or 'myths' are challenged.

A number of water/land-related myths have been found to have an extremely high level of acceptance within WSD programmes and to be disseminated widely through a variety of media and political outputs (Batchelor *et al* 2003). Common water and water forest misconceptions include:

1. Forests Increase Runoff and Local Rainfall

In the majority of cases rainfall is not linked to forests. In those situations where a positive relationship does lead to a small increase in rainfall, the increase in evaporation more than compensates for the small increase in rainfall, leading to an overall decrease in the available water resources. The new understanding gained through transpiration and interception experiments has determined that in very moist and dry climates evaporation from forests is higher than that from shorter crops. Therefore, except in very few circumstances, runoff will consequently be reduced (Calder, 1999).

2. Aquifers are Underground lakes

The idea that localised recharge in one place leads to an immediate rise in groundwater levels at another hundreds of metres away can be dispelled. Groundwater is in continuous motion directed by potential gradients from one location to another through many outlets and subsoil mediums. By drawing water from one location, a cone of depression in the water table will be created around wells; this in turn affects potential gradients and hence the speed and direction of water ².

3. Water Harvesting is a Benign Technology

In specific cases water harvesting structures can produce benefits, however intensive drainage line treatment can cause significant reductions in "down stream" water resources, inducing severe hardship for those peoples lower down the catchment ².

4. Aquifers Once Depleted Stay Depleted

In most cases aquifers can be re-established or replenished as long as the balance towards recharge is favoured and extraction carefully monitored; dispelling the notion that aquifers are zones irretrievable after depletion ².

5. Water Use of Crops Depends Mainly on Crop Type

Water use by crops is based upon meteorological circumstances (wind speed, radiation, dryness of the air), not a range of species specific evaporation rates ².

6. Runoff in Semi-Arid Areas is 30-40% of Annual Rainfall.

At scales larger than the micro-watershed annual runoff is lower than 30-40 per cent. In large areas of India for example mean annual runoff is lower than 5 per cent of annual rainfall. Groundwater extraction, soil water conservation and construction of water harvesting structures have all contributed to a further reduction in mean annual runoff. It is due to these reasons that areas surveyed by the KAWAD Water Resources Audit, showed that inflows to tanks are significantly reduced and ² rivers that were once perennial are now seasonal ².

Decision making based on poor statistics and water-related myths can lead to a waste of human and financial resources, insignificant or even negative impacts on target groups and unsustainable development of natural resources (Batchelor *et al* 2003). A move towards reconciling these 'myths' is therefore a pre-requisite for sustainable land and water management.

² KAWAD, 2001.

Research within this project will validate the hydrological model(s) developed in other FRP FLOWS projects based in South Africa, Grenada, Tanzania and Costa Rica to develop an interactive hydrological model. This will provide the opportunity for those directly affected by the project results to choose the most sustainable method for managing water resources. It is believed that the current large spending of development funds in India on tree planting to boost ground water re-charge may be based upon a serious misconception. Equally-if not more serious -is the concern that the present focus on forestry programmes for improving water resources may be diverting attention away from the urgent need for demand management measures. This would limit the amount of ground water extraction being abstracted to irrigate crops grown in the dry season. This is, in turn, leading to excessive lowering of the ground water table in many southern Indian states. The project and the project's collaborators are best placed to help propose recommendations and implementation for policy change and promote strategies through a variety of outputs

7. STRATEGY FOR POLICY IMPACT

This project aims to have an impact in land and water policy development and implementation at a Central and state level (Himachal Pradesh and Madhya Pradesh). The relationship between researchers and policy makers is crucial. Crewe and Young (2002), hypothesize that when these links are strong researchers should have more influence and policy makers are better able to make use of research findings.

The key elements of the strategy for policy impact developed are:

- The quality of the networks of contacts already maintained by the project partners.
- The development of project activities specifically designed to take into account the policy context.
- The establishment of a user forum with key stakeholders.
- The demonstration to the stakeholders of the latest GIS technologies as a planning and decision-making tool which integrates the hydrological, demographic and socio-economic information.
- The production and targeted dissemination of policy briefs written for key institutional actors.

Collaborating Indian institutions will have specific roles to play; The Indian Institute of Technology Delhi has an active relationship with Central Government Departments involved in land and water management. This project builds upon the capability of IIT Delhi to engage key stakeholders at Ministerial level. In particular, IIT Delhi is a collaborator of the NRDMS programme of DST. DST is seen as a neutral department with good contacts with all other key departments in watershed development. NRDMS has agreed to act as an entry point for the dissemination of the project outputs at the Central and State levels.

Winrock International is well-known in the areas of rural development and forestry. Their contacts in these policy arenas will provide other entry points for project dissemination. Winrock International will also use its established links with International Donors to reach these potentially important agents for change.

The National Institute of Technology at Hamirpur has already established contact with HP Government through the involvement of the HP Council for Science, Technology and Environment in the initial stages of the project. The Regional Research Laboratory, Bhopal and the Centre for Rural Development and Environment, in Madhya Pradesh will use their well-established links with MP Government to develop similar links.

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APPENDIX

Figure 1. WATERSHED DEVELOPMENT & INDIAN MINISTRIES

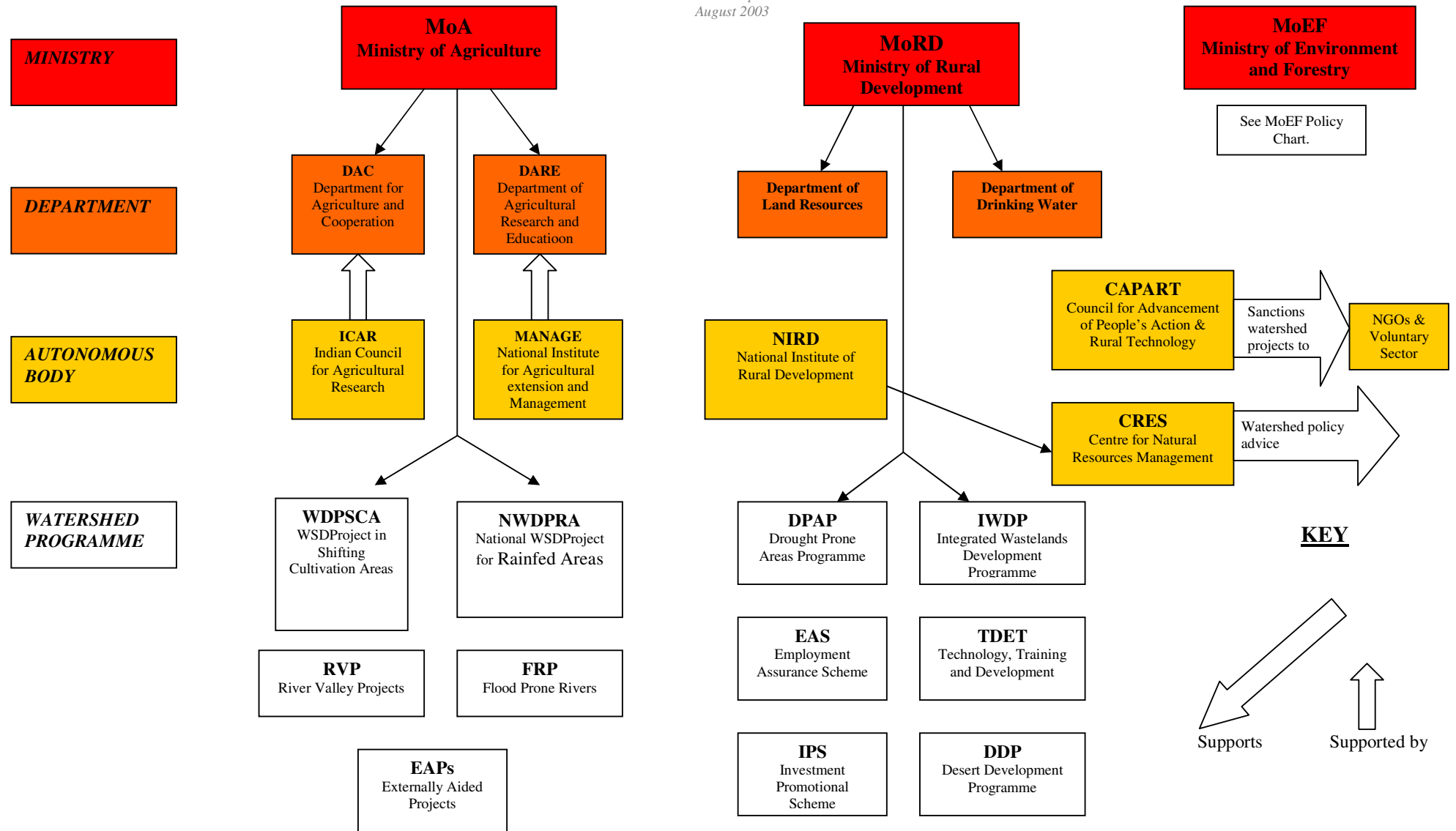
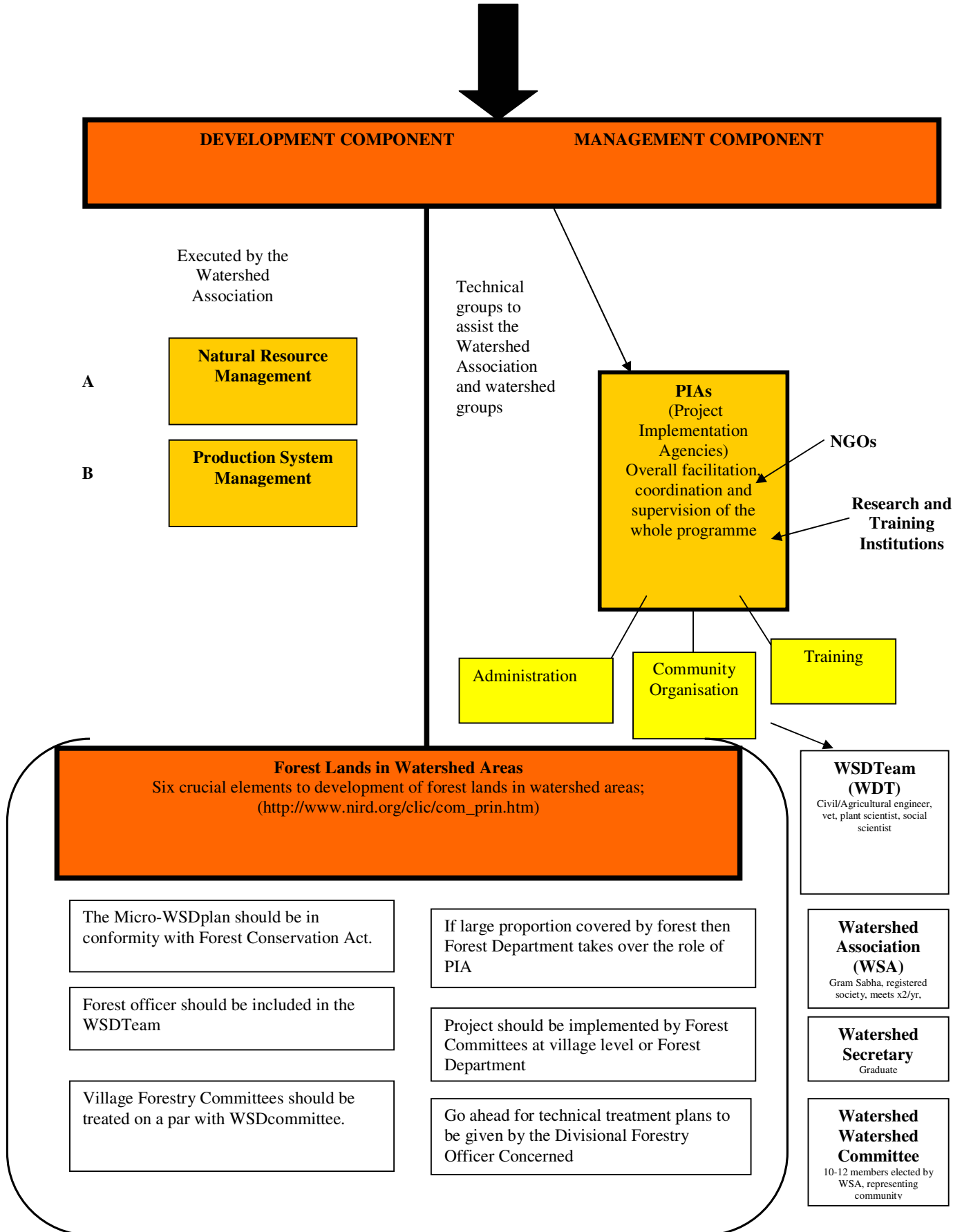


Figure 2. WATERSHED DEVELOPMENT GUIDELINES

WATERSHED PROGRAMME (1994-1995)

Common approach/principles for WSD to bring about convergence, harmonisation away from the previous projects/programmes (e.g NWDpra, DPAP, IWDP, EAS, WDSca, DDP)



**Figure 3. MINISTRY OF ENVIRONMENT AND FORESTRY;
KEY GUIDELINES, POLICIES AND PROGRAMMES IN
WATERSHED DEVELOPMENT**

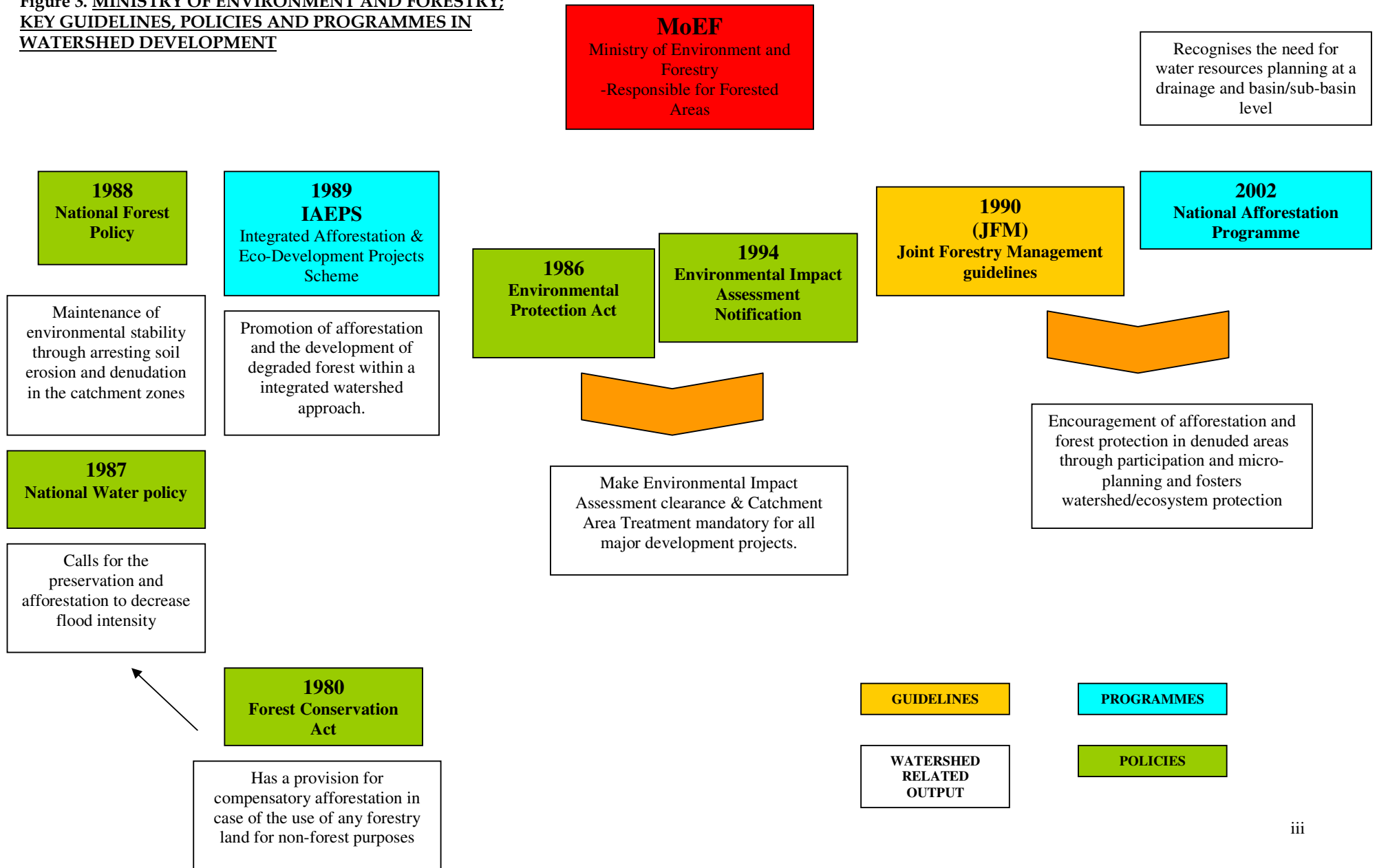


Figure 4. MINISTRY OF WATER RESOURCES & RELATED GROUPS

