



IWRM Survey and Status Report: MADAGASCAR

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April 2009

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EXECUTIVE SUMMARY

Located in 425 km from the coast south-east of Africa, Madagascar has an area of 592,000 Km² covered approximately 17 per cent by forest and to about 6 percent by cultivated land (arable land and permanent crops).

There are two seasons (winter - cool and dry - from May to October and summer - warm and rainy - from November to April) and four climates (tropical moist on east coast, tropical of altitude on center, tropical dry on west coast and semi- arid in extreme . South). The annual average rainfall is estimated to 1,632 mm. Population stood at 19.1 million at end of 2007, of which women is 50.5% and rural fraction is 77.8%. The average annual population growth rate is 0.9% (UNDP, 2001-2015).

Water resources leave of rain: 900 Mm³/year with an evapotranspiration of 410 Mm³/year. According to the water balance of Madagascar prepared by the Ministry of water, the surface water is 555 Mm³/year and groundwater is 140 Mm³/year.

The most important volume is used to agricultural supply, with 13,000 millions of m³/year for irrigation, 1,639 million m³/year for hydro-power, 42.9 million m³/year for domestic use and 4.3 million m³/year for productive use.

Madagascar adopted its Water Code and its declaration of IWRM principles is well specified. Then implementing decrees have been taken to establish Malagasy potable water and sanitation supply Policy. Reduction of childhood diseases related to unsanitary water is a priority according to the commitments of MAP (Madagascar Action Plan 2007-2012). A strategy in this sense was conducted through WASH (Water Sanitation and Hygiene) initiative, established now in 17 of 22 regions of Madagascar.

Its three key messages are washing hands with soap or other detergents, effective use of hygienic latrines and preservation of potability of water from the point of pumping to the consumption. Rural areas infrastructure have been strengthened by PAEAR (Rural Water Supply and Sanitation Program) project.

A Ministry of Water was created in 2008 to consider all water uses and not only resources previously managed by the Department of energy and mines. The ANDEA (National Water and Sanitation Authority) has been hanged to operate the IWRM mechanisms, starting with asking there an authorisation for levies projects. Madagascar is organized in 6 catchment areas in order to operate the process at the lowest level decentralized with committees of basins, committees of sites and coordination at national level.

Monitoring is to strengthen water levies starting at each catchment area level. Water market will be managed there by harmonizing uses according to local needs and national strategies. So will be water quality management. Participation of stakeholders in a comprehensive proximity approach is provided at each catchment area level, with an important role for women in advocacy and behavior changes.

One of basic principles of IWRM process is to consider water as economic value. This is the weakness of implementation of IWRM in Madagascar. Only JIRAMA is well structured in counting system for billings. The rate is higher when the consumed volume increase. Fixed charges also are higher if the caliber of the water meter is larger. The accounting and unaccounting system water is very unbalanced. The efficiency of 26.7% and RUFW of 73.3% pose problems. Without periodic invoicing, measure system does not exist for potable water consumption. For the moment, waste water is neither measured nor taxed. Industries are required by law MECIE (alignment of investments with environment) to treat their waste water according to its standards but this is not yet systematically.

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Thus, in Madagascar, adoption of Water Code since 1999 translates:

- the willingness of the country for coordinating all actions relating to water resource management whatever is the use;
- the country policy of IWRM process.

Actually, IWRM process in Madagascar must be supported in the practices of procedures already provided.

Objectives related to ANDEA (National Water and Sanitation Authority) are not achieved and actions on ground are still looking. Master plan by catchment area must be established and funding is sought after AfDB and UNDP.

Main obstacles identified that we must exceed are:

- Large space dispersion of users targets because Madagascar is vast so satisfaction of users needs is difficult. Local structures are not enough functional. Infrastructures are inadequate and/or need rehabilitation.
- Lack of relationship and terms of involvement between the institutions, stakeholders at all levels (committees of catchment areas, committees of sites within the basins, schools, families, women) through :
 - o Clarification of mechanisms and practices
 - o Cooperation of stakeholders
- Insufficient technical and financial capacity to strengthen :

Database, water resources inventory which requires additional equipment, counting of use, accessibility of information for stakeholders, operationalization of the Human Resources and Technical Center within the CNEAGR (National Centre for Water, Sanitation and Rural Engineering).

- Accounting water supply to strengthen in its principles, operational system and tools
- Monitoring is not practiced enough for quantitative and qualitative water management, management of releases and evaluation of compliance with legal provisions, organization and procedures.

Legal framing, institutional organization, strategies implemented with objectives according to priorities of the country are IWRM instruments already exploitable.

Cooperation with GWP or GWP-SA in order to continue IWRM process in Madagascar should be :

- Integrate exchanges of experience platforms to better know other countries practices and draw lessons for Madagascar: especially for databases, accounting system, mechanisms for effective involvement of stakeholders;
- Integrate information networks for similar thematic ;
- Participate in events organised by GWP to ensure capacity building ;
- Strengthen partnership for financing water sector.

In the management of its strong water resource, Madagascar needs to be strengthened to make IWRM process operational and effective. Partnership through GWP or GWP-SA could achieve that.

CHAPTER 1. BACKGROUND AND CONTEXT

11. PROJECT BACKGROUND

(Regional consultant and GWP to provide a common introductory)

12. GEOGRAPHIC CONTEXT

121. Location and geomorphology

Located between the Mozambique canal and the Indian Ocean, with Comoros to the North, La Réunion to the East and South Africa in South-west, Madagascar is the fourth of the largest islands in the world. With an area of 592,000 km², with a length of 1,600 km from North to South on a maximum width of 600 km from West to East, Madagascar is between 12° and 25°30' of latitude (South), 42° and 50° longitude (East), at 425 km from the African south-east coast, in the intertropical zone.

The geomorphology of Madagascar is characterized by two sets :

- A high region called highlands of Madagascar, extending over the 2/3 of the total area. There are the higher mountain of Madagascar, the maximum elevation is 2,876m (massif of Tsaratanana). The highlands are lowered gradually toward the west from an average elevation of 2,000m, by lying scattered and suddenly by 2 cliffs toward the East.
- Sedimentary coastal basins occupy the 1/3 of the total area, including the regional differentiation can distinguish :
 - The basin of North dominated by volcanic massifs and limestone, small size, with a small clay coastal plain.
 - The great basin of the West sloping toward the West with bedding sandstone, volcanic cretaceous and sandy clay plains.
 - The southern basin sloping toward the South, dominated by old dunes and recent dunes along the coast.
 - The basin narrow the coast. The coast of Madagascar is dominated by mangroves and marshes along the west coast, by dunes in the South-Western part and extreme South, and by sandy beaches in the East.

122. Climatology and climate change

Madagascar enjoys four important climates because of its geographical position, the form of relief, maritime influence and the regime of the winds. On the east coast and the plain of North . North West, humid tropical climate with annual average rainfall of 2,000 to 3,600 mm. On the highlands, tropical climate of altitude with annual average rainfall of 2,000 mm to 1,000 mm from East to West. On the west coast, dry tropical climate with annual average rainfall of 800 mm to 1500 mm. In Extreme South, semi- arid climate with annual average rainfall less than 400 mm.

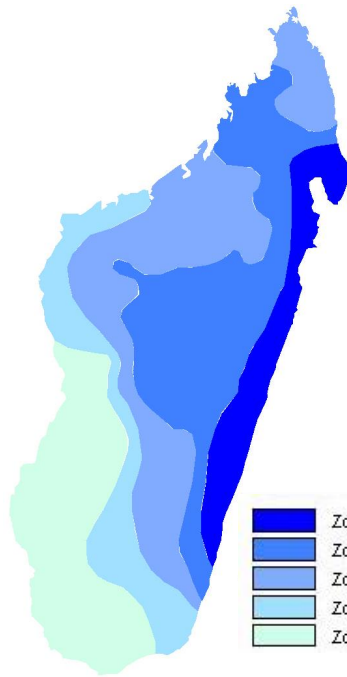
There are two well marked seasons:

- The cool winter season, from May to October, governed by the trade winds of South-East providing first a fresh wet wind on the east coast, becoming dry on the rest of the island.
- The rainy summer season, from November to April, is warm and dominated by the Monsoon of the North West providing rain on the whole country.

Mean temperature varies from 16 to 20°C in the highlands. The West coast is warmer than the East coast. The mean maximum temperature is 28°C on the East and 32°C on the Western slope. The annual mean temperature is estimated at 17.8°C.

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The annual average rainfall is estimated to 1,632 mm by the national meteorological service.



Legend :

Zone I	rainfall > +1000 mm : area very wet
Zone II	+200 mm < rainfall > +1000 mm : wetland
Zone III	-200 mm < rainfall > +200 mm under-wet area
Zone IV	-400 mm < rainfall > - 200 mm : semi-arid zone
Zone V	rainfall < -400 mm : arid zone

Climate change occurred by late rains, increasing the period of drought, and then brings very strong rain when they fall. This phenomenon generates risk of flooding and heavy water contamination linked to different wastes trained. The reduction of mortality linked particularly to availability and healthiness of water, reinforced by climate change, is strategically priority for Madagascar. An interdepartmental "health and climate change+Committee of which first responsible is the meteorological service has existed since 2008.

123. Land use and administrative organization

According to the monograph of Madagascar prepared by FAO, forest covers around 9.86 million Hectares which represents 17 percent of total area. Cultivated areas (arable land and permanent crops) represent 3.6 million Hectares which is about 6 per cent of the whole area of Madagascar. Food crops are basic agricultural activities and dominate the central highlands, the middle part of the west and the eastern part. The cash crops (industrial or export) occupy the eastern, the north, the south and the west part.

22 régions of MADAGASCAR



Madagascar has opted for a decentralized administration. Administratively, the island is therefore divided into twenty-two (22) regions following the map below.

Organization of catchment areas refers to this territorial administration.

13. SOCIAL AND ECONOMIC CONTEXT

131. Population and demographic features

- Population : 19.1 million at end of 2007, of which women is 50.5% and rural fraction is 77.8%.
- Average annual population growth: + 0,9 % (UNDP, 2001-2015)
- Life expectancy: 59 ans (UNDP 2006)
- Literacy rate: 59%
- Human development index : 143 on 177 (UNDP 2007)
- HIV AIDS prevalence rate: 0.51% for adults between 15 and 49 (UNAIDS 2006)
- Rate of access to safe potable water: 37,45 % with 30,09% in rural areas and 63,49% in urban areas (Ministry of Energy, Direction of potable water and sanitation 2005)

132. Major economic sectors by GDP

The major economic sectors of Madagascar as a function of water demands are:

- Agriculture, particularly irrigated rice and generally food crops;
- Industrial sector especially food;
- Hydro - electricity, but more important thermal energy;
- Tourism sector.

133. Recent and projected changes to the society and economy

Madagascar has acceded to the statements made in the framework of the Millennium Development Goals (Mdns) to reduce by half the proportion of population living in extreme poverty by 2015.

According to the MAP (Madagascar Action Plan 2007-2012) "The strategies and projects in the MAP are geared to an effective reduction of poverty and a tangible improvement of Malagasy quality life". The major objectives of development of Madagascar for 2012 are:

Indicateurs	2005	2012
United Nations Human Development Index	146 of 177 countries	100
Poverty rate (percentage of population living on less than 2USD per day)	85,1% (in 2003)	50%
Size of family (fertility index)	5,4	3 à 4
Life expectancy	55,5	58 à 61
Literacy rate	63%	80%
Percentage of pupils who completed secondary school	College : 19% Secondary school : 7%	College : 56% Secondary school : 14%
Economic growth	4,6%	8 à 10%
GDP (USD)	5 billions	12 billions
GDP per capita (USD)	309	476
Direct Investment Abroad (USD)	84 millions	500 millions
Classification Business Environment (World Bank)	131	80
Corruption perception index	2,8	5,2
Percentage of households with land titles or certificates	10%	75%

CHAPTER 2. WATER RESOURCES SITUATION

21. WATER AVAILABILITY AND INFRASTRUCTURE

211. Water and sanitation sector context

Potable water, sanitation, hygiene, water resources are priorities of the Malagasy Government, and are present in the MAP (Madagascar Action Plan 2007-2012).

The Water Code, in its Article 1, stipulates that "the water is part of the common heritage of the Nation. Each community is the guarantor in the framework of its powers+. In its Article 2 "water is a public good in the public domain".

The Article 19 talks about sanitation: "According to this Code, sanitation means any measure intended to remove causes of unhealthy for protection of water resource, convenience of neighbourhood, health and safety of population, public health, agriculture, protection of the nature and the environment, for conservation of sites and monuments. Sanitation of agglomerations means ensuring disposal of rainwater and sewage as well as their rejection in the natural outfalls under modes compatible with the requirements of public health. Collective sanitation of domestic waste water concern; the evacuation and the treatment of waste water by consumers after having been distributed by the systems of potable water supply+.

Concerning infrastructure of water supply, the Water Code, in its Article 39, stipulates that "Potable water supply and access to collective sanitation of domestic waste water is a public communal service. Auto production does not constitute a public service. However, in case of absence or inadequacy of provision of public service potable water supply in the concerned area, a private service may operate a public potable water supply [ō]. »

212. Hydrology

a) Surface water :

- The hydrographic network :

Madagascar has 30 streams and 88 rivers with about 3,000 km of watershed.

- Other aquatic environments and wetlands :

Consisting principally of the lakes which cover approximately 2,000 km², by lakes and lagoons and dams;

- The channels coastlines and mangroves.

b) Ground water:

Without precised knowledge of groundwater resources, the situation of resources by geographic area in Madagascar is below:

- Sedimentary Area of the Extreme-south: deep groundwater located at great depth (50-170m), exploitable at rates very low (< 3m³/h) and at depths less than 20m, with the flows very low (1 to 4m³/h).
- Crystalline area has low rainfall of the South: cracks with the flows weak at a depth of 15 to 20m and higher speeds (10 m³/h) at a depth of 50 to 70m.
- Sedimentary area of Toliara : limestone, sands superficial, beach sands,.. with rates flow up to 3,000m³/h
- The high plateaux of Centre: alluvial aquifers giving the flows of the order of 25 m³/h/m and aquifer in laterites at data rates very low (0.1 to 0.2 m³/h/m). The water of cracks is still poorly known.
- Sedimentary zone of Antsiranana (north): sands of beaches with rate flow up to 12 m³/h) and volcanic formations giving flow in order to 25m³/h.

It may be necessary to point out the importance of aquifers of lateritic and groundwater of stand cracked because they are at the origin of surface water flow in Madagascar. In fact, they can assure the water supply of urban and rural areas, but also for agriculture or livestock.

213. Water resources infrastructures

The supply infrastructures in potable water are normally and predominantly provided and administered by JIRAMA (National Water and electricity Utility), especially in urban areas. However, in accordance with the Water Code (Art. 39), other private operators and local communities can provide infrastructure and manage infrastructure, particularly in rural areas.

The main types of supply infrastructures water are:

1. Gravity potable water supply
2. Protected spring
3. Hand-dug well
4. Artesian well
5. Borehole with hand pump
6. Borehole with mechanical pump
7. Borehole with immersed electric pump
8. Catchment of surface water : dam, rafts, dyke, boom
9. Rain catchment by roof and impluvium
10. Telescopic casing
11. Room with drain
12. Pipe-lines

In general, the infrastructure 1, 3, 5 and 9 are more often encountered in rural areas. In urban areas, the JIRAMA (National Water and electricity Utility) uses the infrastructure 2, 4, 8, 10 and 11.

The capacity of water storage of the JIRAMA is 92,995 m³ split in 95 reservoirs all over Madagascar.

214. Water quality

Freshwater areas sedimentary (coastal areas) are more mineralized than those of the high lands (stand crystalline) but in the whole, the natural waters in Madagascar is less mineralized.

- Potable water :

There are potability standards for good consumption water. They are fixed by the Ministry of Health of Madagascar and are based on recommendations of the WHO (World Organization of the Health) concerning the organoleptic, physical and chemical characteristics; the bacteriological quality.

The Water Code, in its Article 38, mentions that "Any water delivered for human consumption should be potable. ¶ " And then into Article 58, "The monitoring of the water quality is carried out systematically by the competent authority. Any operator is required to continuously monitor the water quality by regular checks [¶] »

The JIRAMA (National Water and electricity Utility) then proceeded to auto permanent monitoring of the water quality produced in each of its production centres, in order to meet the standards of potability prescribed in the Decree N°2004-635 of 06/15/04. It will carry out of confirmations systematic periodicals to the Pasteur Institute of Madagascar.

- Industrial water

There are some very specific recommendations for the qualitative needs for boiler or cooling water on their degree of mineralization (low), but with the waters for manufacturing, only a few industries are the subject of recommendations (brasseries, paper mills, dairy industries).

22. WATER USE, DEMANDS AND REQUIREMENTS

221. Hydrological cycle water balance

The following table gives the hydrological water balance for an annual average rainfall of 1,632 mm.

Table 1: Hydrological water balance

	Millions de m ³ / an	%
Rain	900,000	100
Surface water	350,000	39
Ground water	140,000	15.5
Evaporation / evapotranspiration	410,000	45.5

Source : Water Balance of Madagascar (Ministry of water)

Water resources available to Madagascar therefore amount to 490 000 million cubic meters per year. For the JIRAMA (National Water and electricity Utility), the quantity of water extracted in 2007 is given by the table below :

Table 2: catchment Water Resources by JIRAMA

	Millions of m ³ / year
Surface water	159.9
Ground water	25.2
Total	185.1

Rate of water resources utilization by JIRAMA is 37.7% .

222. Water sector use and water supply system

a) Water utilization by sector

Globally, the water resources consumption in Madagascar is summarized by the following table:

Table 3: Water consumption in Madagascar

	Millions of m ³ /year
Agriculture	14,313
With Irrigation	13,000
Domestic	42.9
Productive : industries, hotels and restaurants	4.3
Hydro-power	1,639

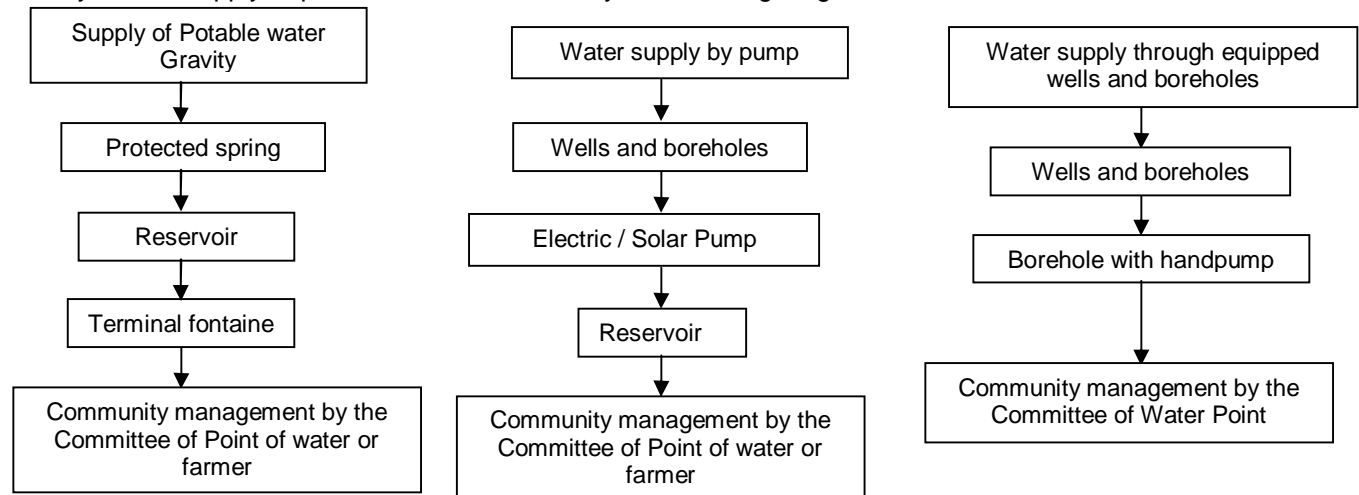
Source : FAO and JIRAMA (National Water and Electricity Utility)

The domestic and productive water consumption and utilization for hydropower are accounted by JIRAMA (National Water and electricity Utility). The consumptions for agriculture are estimated.

b) Water supply system and demand trends

Water supply is generally considered two areas: the cities of more than 2000 inhabitants (urban) and the villages of less than 2000 inhabitants (rural).

The system of supply of potable water is defined by the following diagram :



In urban areas, the infrastructures are provided and administered by the JIRAMA (National Water and Electricity Utility)

Trends for potable water supply in rural areas are more and more by numerous actors. In urban areas, the new constructions are also request of water connections by the JIRAMA. In this sense, the trend of Madagascar would be a rate of access to potable water of 63% by 2015.

23. KEY WATER RESOURCES ISSUES, CONCERNS AND PRIORITIES

231. Water governance issues

THE ONE (National Office for the Environment) is in charge of preventing environmental risks in the public and private investment and the fight against pollution.

The CNRIT (National Center of Industrial Research and Technological) contributes enormously to the construction of basins of the salaries of discharges of waters of industries.

For mitigation of pollution by wastewater, the decree MECIE (Alignment of investments with the Environment) stipulates the qualities of pollution and requires any industrial installation to carry out studies of the impact of its discharges on the environment. This law also requires to existing industries to proceed with the compliance of their discharges. But it is imperative in relation to different program to be carefull for contamination drinking water without hygienic sanitation system. So, often, pressure of the coastal populations may also require the facilities to carry out the treatment of their effluents by industries.

232. Water scarcity/stress

A country is ~~water-stressed~~ when its potential supply of water is less than 1700m³/ person/year. It is water-scarce when the supply of water is lower than 1000 m³/ person/year (UNDP 1998).

Madagascar has a provision potential in water usable 490 000 million m³ (see chapter 2). With a population of 19 100 000 inhabitants, the equivalent is 25 600 m³ per person per year. Madagascar is therefore not in a situation of water-stress.

233. Major threats to water resources and quality deterioration

Major water resources contamination risks for Madagascar are:

- chemicals and pesticides used by the farmers which defile the land and seep then
- The contamination of groundwater by non-hygienic latrines

Bush fires as to them increase the greenhouse effect and could lead to a decrease of rainfall.

234. Priorities for engagement

Waste water is directly dumped in the mid receiver, without treatment. Landfills are too often "wild" and without control. The environmental impact of these public infrastructures, which should be the subject of impact assessment according to the regulations in force, is poorly known.

The integration of sanitation for potable water supply projects as a key element for the reduction of diseases related to water was imposed in the priorities of Madagascar development. A study conducted by WHO (World Health organization) in 1992 has shown that the consumption of efforts in the field of potable water and sanitation allows to reduce the diseases related to the water of the order to 37% while action in the field of potable water conducted in a isolated manner provide only a reduction of 18%.

- *The Policy and National Strategy of sanitation (PSNA) adopted in November 2008 pleads for environmental compliance of such infrastructure, prioritization in the sites where the environmental impact is proven or in the presence of nuisances. In particular, household waste must be deposited in landfills and duly established*
- *The PSNA supports the establishment of a service of systematic control of sanitation infrastructure domestic, industrial and mining within the Department responsible for the Environment.*
- *The initiative WASH (Water Sanitation and Hygiene) was launched to support and reorient the projects in the water and sanitation sector in priority for elimination diseases in relation to water contamination.*

CHAPTER 3. ACTUAL STATE OF THE IWRM PROCESS

31. POLICY AND LEGISLATION ALIGNEMENT

311. Water Code

The Water Code, law # 98 . 029, promulgated by the Malagasy President, was adopted by the National Assembly on 19 December 1998. The objects of the Water Code are :

- Public state ownership of water;
- Management, conservation, and development of water resources;
- Organization of public service of potable water and sanitation;
- Collective of domestic waste water;
- Police on water;
- Financing of water and sanitation sector;
- Organization of water and sanitation sector.

The Water Code in its Title II Article 9 and Title V Article 75 talks about IWRM and water and sanitation sector :

- "TITLE II: WATER RESOURCES MANAGEMENT; ARTICLE 9: Provisions of this title are for implementation of integrated water management policies with regards to relations between quantitative and qualitative aspects or between surface and groundwater. »
- "TITLE V: ABOUT ORGANIZATION OF WATER AND SANITATION SECTOR; ARTICLE 75: In order to ensure the integrated water resources management and the rational development of water and sanitation sector, the National Authority of the Water and Sanitation (ANDEA) is created. »

The Code has 11 Decrees of application, of which:

- Decree # 2003- 941 amended by decree 2004-635 of 15 June 2004 concerning water monitoring, human consumption water control and priorities of access to water resource
- Decree # 2003-793 of 15 July 2003 fixing the procedure for granting water levies authorizations
- Decree # 2003-792 of 15 July 2003 on charges of levies and spills
- Decree # 2003-942 of 09 September 2003 concerning the use of hydroelectric water
- Decree # 2003-943 of 09 September 2003 relating to spills, absorptions, discharges, direct or indirect deposits in surface waters or groundwater

312. National Policy concerning potable water and sanitation

A sectoral policy declaration for water and sanitation was imposed in 1994. A national program of access to potable water and sanitation (PNAEPA) exists. The first document has been validated in 2005, for the period 2005-2006 -2007. The 2008-2012 period of PNAEPA has been setting in June 2008.

Moreover, considering effects on health of lack of sanitation and hygiene measures in the state and natural environment of Malagasy people, Malagasy government adopts a national strategy and policy for sanitation (PSNA) by Decree # 2008-1057 of 10 November 2008. It aims to strengthen and improve effectiveness of sanitation actions, at national and local level.

313. Diorano-WASH Initiative

The national strategy and policy for sanitation relies fully on Diorano-WASH (Water Sanitation and Hygiene) initiative. Diorano . WASH initiative prioritizes awareness on the based on 3 key messages: washing hands with soap or other elements detergents, actual use of hygienic latrine and preservation of the potability of water from the pumping to the consumption. The Decree # 2008 . 094 approves and adopt the Diorano . WASH Charter.

314. Alignment of investments with the Environment (MECIE)

The Alignment of investments with the Environment was adopted by the Decree # 99-954 of 15 December 1999 amended by decree # 2004-167 of 03 February 2004. The Decree MECIE fixes the rules and procedures to follow for alignment of investments with the environment and specify nature, responsibilities and degree of authority of different institutions empowered.

32. INSTITUTIONNAL ARRANGEMENTS

321. Identification of stakeholders

1. Ministry of Water
2. National Water and Sanitation Authority (ANDEA)
3. National Water and Electricity Utility(JIRAMA)
4. Meteorological Service
5. National Center for Water, Sanitation and Rural Engineering (CNEAGR)
6. National Institute of Statistics (INSTAT)
7. National Office for Environment (ONE)
8. Coordination Initiative WASH (Water Sanitation and Hygiene)
9. Financial Partners :
 - UNDP (United Nations Development Programme)
 - UNFPA (United Nations Population Funds)
 - UNICEF (United Nations Children's Fund)
 - World Bank
 - European Union
 - USAID
 - AFD (French Agency for Development)
 - African Development Fund (ADF)
 - African Development Bank (AfDB)
 - BADEA (Arabian Bank for African Development)
10. WATER AID Madagascar
11. Rural Water Supply and Sanitation Programme (PAEAR)
12. Development Intervention Fund Project (FID)
13. Ministry of Agriculture, Breeding and Fisheries

322. Objectives and Functions of the Institutions and Stakeholders Engagement

The objectives and functions of major institutions and stakeholders engaged are given in the following table:

Institutions and stakeholders	Objectives and Functions
Ministry of Water	Created in October 2008, it is the highest institution for definition of policies and national strategy for the water and sanitation
National Water and Sanitation Authority (ANDEA)	<p>The Water Code defines 24 Missions of ANDEA including the following:</p> <ul style="list-style-type: none"> • Develop and program the national master plan for water resources management; coordinate, plan, program all projects of water and sanitation and monitor the implementation • Prepare the access priorities of water resource and develop the national water standards • Enhance the use of groundwater and surface water • Monitor and evaluate effectiveness of reorganisation measures and prevention of water resources pollution • Develop and ensure implementation of national strategies relating to Integrated Water Resources Management • Ensure coordination of Integrated Water Resources Management • Coordinate implementation of Water resources Master plan by catchment area or groups of catchment areas <p>Organization under the supervision of the Ministry of Water</p>
National Water and Electricity Utility (JIRAMA)	State Society with the exclusivity of water production and distribution in urban areas, but also carries out water production and distribution in rural areas
National Center for Water, Sanitation and Rural Engineering (CNEAGR)	<ul style="list-style-type: none"> • Training and technical support • Studies in rural development; rural infrastructure, potable water supply, and hydro agricultural development • Logistic support: organization of workshop and conference, provision of technicians and specialized equipments for hydrological studies • Management of the human and technical resources Center for all benefits on water at lower cost and provision of training and information around water and sanitation <p>Agency under the technical supervision of Ministry of Water since October 2008</p>
Office National pour l'Environnement	<ul style="list-style-type: none"> • Prevention of environmental risks in the public and private investment and fight against pollution: one stop shop for environmental permit issue • Management of the system of environmental information, monitoring and evaluation of the state of the environment <p>Agency under supervision of the Ministry of Environment</p>

Institutions and stakeholders	Objectives and Functions
Structure de l'initiative Diorano-Water Sanitation and Hygiene (Initiative Diorano-WASH)	<ul style="list-style-type: none"> • The President of honour (represents the concerned Ministries) : chairs the major events and intervenes with the government • The national Committee valid strategic guidelines and adopt assessments and evaluations • National Core Committee proposes, implements, organises the exchanges, monitors and evaluates • The national coordinator coordinates, animates, manages, follows the actions • The Regional Committees develop WASH activities, ensure tasks and links with the regions (according to the administrative distribution of Madagascar in regions)
Rural Water Supply and Sanitation Programme (PAEAR)	Achievement of water supply infrastructure work in rural areas of 8 regions hitherto financed by AfDB
WATER AID Madagascar	<ul style="list-style-type: none"> • WaterAid objective is to enable poorest population in the world to access to safe potable water, to sanitation services and education hygiene. • Strengthen advocacy capacities of direct beneficiaries of its supported projects, but also those of the whole Community and local civil society • Undertake advocacy at local and international level to change policies and practices and to ensure recognition of the vital role of water and sanitation in poverty reduction <p>Malagasyr representative of the International Water Aid NGO with headquarters in Great Britain</p>

323. Pricing and financing

The Water Code defines the water and sanitation sector financing policy in its Title IV: The financing of water and sanitation sector:

- ARTICLE 69: In order to participate in conservation financing, mobilization and protection of water resources, royalties on resources levy, deterioration of resources quality and modification of water system may be imposed
- ARTICLE 71: Financing of resources mobilization or protection infrastructures may also be ensured by specific charges. These specific charges are due, on an equal and fair basis, for any use and any physical or legal person, public or private beneficiary. Whenever possible, the structure of management of these structures must be a business autonomous trade structure of common law.
- ARTICLE 72: The National Water and Sanitation Authority may collect funds, donations and legacies of any nature by regulatory procedures, for water and sanitation sector benefit
- ARTICLE 73: A National Fund for the Water Resources is established for specific needs of funding for conservation, mobilization and protection of water resources quality. [ō]

33. WATER STRATEGY AND INSTRUMENTS

331. Existence and nature of national IWRM strategy

Application of IWRM principles is guaranteed by the Water Code of chapter 311. IWRM principles are taken into account in the general development policy of Madagascar, which is Madagascar Action Plan 2007-2012 or MAP :

- Commitment 7, challenge 2: to take care of the environment - to reduce the process of natural resources degradation, priority 12: Developing an integrated plan for water resources management, which includes reforestation promotion to protect sources areas, monitoring wells and groundwater, increasing effectiveness of culture systems for improved management of potable water resources, water supplies and ecosystem+

IWRM is also taken into account by the National Program of access to safe potable water and sanitation (PNAEPA) in its sub-program 2: integrated water resources management for the guarantee of potable water access and protection against pollution.

Activities for Integrated Water Resources Management fit in the implementation of a policy and strategy of inventories and water resources management, for a rational and equitable use (between the different users), as well as for their protection and conservation.

332. Past and planned process of developing the strategy

The main steps already spent for IWRM development are:

- Declaration and legislation
- Establishment of IWRM management institutions

The implementation of IWRM is triggered since 1998, but actors coordination is not effective and does not progress enough.

The main planned action for the IWRM process development is strengthening of agencies and committees basins with establishment of master plan by basin coordinated by ANDEA (National Water and Sanitation Authority) and the Ministry of Water

333. Linkage with other sector planning processes

The most important planning processes for Madagascar are :

- Green revolution with agricultural irrigation and the appropriate structures of catchment area management and irrigated areas;
- Environmental management plans for water component, of which environmental monitoring is carried out by the National Office for Environment (ONE) and the sectors affected;
- Plans for chemical risks management with Madagascar's accession in various international conventions particularly for chemical water risks;
- Actions in health sector, food security and school education mostly because of the important role of water;
- Intensive reforestation program for reducing greenhouse effect and increase water resources.

34. IMPLEMENTATION OF IWRM A MADAGASCAR

341. General Status

IWRM process is well underway in Madagascar through laws and decrees adopted, institutions and structures created, programs committed and stakeholders identified as well as geographical organization.

342. Management of water rights

Law enforcing is not effective for resources management and water uses concerning authorisation for levies projects. The compliance of enterprises to the decree MECIE (Alignment of investments with the Environment) is not yet systematic. The financing and fee system provided by law and the national fund of water are not functional.

343. Progress with implementation of IWRM

The institution of the Ministry of Water is an important step in the implementation of IWRM in Madagascar. Practical improvement at each level of the 6 catchment areas in Madagascar is a progress of mecanism process.

Concerning the engagement of stakeholders, theoretically and practically, programs only intervene on certain areas mostly because Madagascar is vast. Commitments are then easier to manage. The participation of stakeholders improves at local level especially for resources management, levies and water demands in their respective localities.

- Progress on monitoring :

Monitoring WASH (Water Sanitation and Hygiene) committee according to local and national strategies and priorities and exchange on WASH platform are put in place. However, Madagascar wants to progress on Integrated Water Resources Management (IWRM) mobilization of local community

The progress of research along development axes are:

- Development of potable water access by strengthening, extension of infrastructures and construction of new infrastructure
- Development of access to healthy sanitation by improving access to the entire population to adequate sanitation infrastructures for the protection of populationsq health; the safety of the environment and the protection of water resources against pollution
- Development of public private partnership by establishment of satisfactory quality and sufficient quantity of water supply
- Capacity building of the sector through the establishment of the center of engineering of water and sanitation; the development of capacity of private sector/Ngos, the mobilization and health education of communities and the effective implementation of the decentralisation

35. MONITORING AND EVALUATION

Level gaps monitoring are:

- Gaps in the monitoring of the enforcing of laws
- Insufficient capacity for monitoring because of lack of reference data
- Inadequate dissemination of information and communication on the process therefore the roles are not played because of lack of means and capacity but also because of lack of news.
- Lack of shared visions of the whole processes concerning positioning and modalities of respective involvement

In fact, the IWRM establishment is rather theoretical except for specific programs and the overall approach is insufficient. However, the approaches undertaken allow building IWRM at local level and ensuring effective coordination.

CHAPTER 4. ACTUAL STATE OF WATER ACCOUNTING

41. RELIABILITY OF THE WATER USE INFORMATION

411. Major water use Sectors

In a catchment area the major uses of water are:

- Domestic urban and rural hydraulic for potable water;
- Agricultural Hydraulic
- Pastoral Hydraulic for livestock water
- Industrial hydraulics
- Mining Hydraulic
- Hydro electricity
- Water environmental

The information relating to the water users for every sector are not always generated except for the domestic and hydropower with the JIRAMA (National Water and electricity Utility). In their respective areas, Water Aid Madagascar, WASH (Water Sanitation and Hygiene) as well as the CNEAGR (National Centre for Water Sanitation and Rural Engineering) manages databases more or less well supplied.

412. Different zones of water catchments

The main areas of water catchments fall within JIRAMA (National Water and electricity Utility), through 97 production centres established in the country as follows:

Zones of catchments of JIRAMA	Number of production centres
Tana	11
Grand Tana	2
Fianarantsoa	17
Toamasina	10
Mahajanga	20
Antsiranana	15
Antsirabe	9
Toliary	13
Total	97

The production systems of the centres are different which corresponds to the hydrological situation in each zone :

- Water surface :
 - Production system by gravity and dams of rivers
 - Pumping in the rivers
- Groundwater :
 - Pumping System after drilling
 - System of wells or telescopes and pumping

The data relating to these centres are available from JIRAMA (National Water and electricity Utility). Presently, the other sites of catchments are disparate and without information. The NGOs, and support projects generally work in these same zones exclusively in rural areas and with of groundwater.

413. Water supply and sanitation value chain

Normally, according to the laws, any catchment from the raw water in one zone must be known of the local community decentralized and the entire concerned stakeholders. The accounting system of water is well structured for JIRAMA (National Water and Electricity Utility), The used systems for this effect as well as the recovery of costs are the following:

- Counting system during production: The volumes of water injected into the hydraulic network are all accounted at the source
- Counting System for consumption: Each water user is equipped with an individual counter.
- System of recovery of costs:
 1. Statement of monthly consumption counters to months M
 2. Emission of invoices the month M +1
 3. Total amount is collected, 10 days, at the latest after the issue of invoices

For other operators, the counting system is not always applied, to the extent that there is no necessary billing prepare. The wastewater discharged in each area is not accounted.

414. Availability of Data

The resources inventory data about raw water and treated water are insufficient. The limigraphic or piezometric metering systems with regular and reliable information, do not cover all the six catchment areas of Madagascar . So informations which are the bases of authorization to be theoretically to applied to the ANDEA (National Water and Sanitation Authority) for projects of levies are not available. Presently, it is not yet in the practice but the country would undertakes it by IWRM processing with its existing laws . The information should therefore be established by catchment area and known by stakeholders. JIRAMA (National Water and electricity Utility) ensures an accounting at its sources and to the distribution but does not care of uses after its water meter. So utilization by sector is not available and is usually estimated, from the areas used for example for irrigation.

42. WATER ALLOCATION

421. Organization and procedures

The water supply organization and its accounting is defined as follows:

- Production and distribution of water exclusively by JIRAMA (National Water and electricity Utility) in urban areas;
- Production and distribution in rural areas by JIRAMA (National Water and electricity Utility), NGOs, by different rural programs like PAEAR (Rural Water Supply and Sanitation Program),
- For awareness, the strategy WASH (Water Sanitation and Hygiene), is officially launched in 2002, as it has already been presented in chapter 3 on strategies and stakeholders. To ensure the supply, JIRAMA (National Water and electricity Utility), which is mainly active in urban areas, must ensure the rehabilitation of its infrastructure which are already outdated. The actors in rural areas must carry out work for the rehabilitation of water points, construction of supply systems for potable water (AEP), realization of drilling equipped with manual, solar or electric pump. For dealing with its customers requests of water connection, JIRAMA (National Water and electricity Utility) analyze its infrastructures possibilities and then the economic performance. However, it takes decisions with regards to national strategic priorities. As it is member of WASH, it participates in its activities, through potable water supply for educational institutions and sanitary centres.

422. Standards considered for water allocations

For water allocation and meeting needs, the following standards are used by the JIRAMA:

- In urban areas, specific consumption varies from 44l / j per capita to 100l / day per capita ;
- In rural areas it is on average of the order of 15l / day per capita

For Infrastructure implementation, for the water supply by the PAEAR (Rural Water Supply and Sanitation Program), the standard used is a reservoir of 50 m³ for a village of 2000 inhabitants.

423. Approaches for planning and authorisation or trading

According to the Water Code, authorization of ANDEA (National Water and Sanitation Authority) is required for projects of water catchment to ensure that type of use and the volume needed are justified with regards to the water resources and utilizations in the concerned zone. Normally, this approach applies in all catchment areas. Currently, it is not yet actually practiced.

JIRAMA (National Water and electricity Utility) deals rather its requests for water supply according to its planning and its possibilities in equipment of water connections.

43. WATER PRICING AND TARIFFS

The distribution to major water users with systematic billing procedure is essentially ensured by JIRAMA (National Water and electricity Utility). So the system of pricing and tariffs is illustrated by practices of JIRAMA like treated below.

431. Pricing System

The JIRAMA applies a single tariff grid for the remuneration of consumption, throughout the territory. This grid is given in the following table:

CODE	CATEGORY OF CONSUMMERS	October 2008 to this day
	CESSIONS	
06	- Internal Consumption	0.492
08	- Assignment of water to the activity electricity	0.492
	PRIVATE CONSUMMERS	
50	- Small consumer <= 1,000m ³	
	- First tranche < 10m ³ /mois	0.203
	- Second tranche > 10m ³ /mois	0.492
52	- Hydrants	0.203
55	- Large consumer > 1,000m ³	0.513
	ADMINISTRATIONS	
60	- Small consumer <= 1000m ³	0.492
65	- Large consumer > 1,000m ³	0.513
	DECENTRALISED COLLECTIVITY	
70	- Communal Services	0.203
71	- Hydrants	0.203
72	- Other facilities	0.203
	SPECIAL USES	
80	- Uses port (sales to ships)	1.39
85	- Construction Site	1.01

EMU unit = USD/m³

This uniformity results from the adoption of a tariff system with equalization throughout the malagasy territory. Taxes which differ from one zone to the other and fixed charges must be added.

432. Pricing according to the sectors

There is not differentiation pricing according to the sectors. With regards to the type of customers, for municipalities the water tariff to be served to the public population is lower than individual connections. In Madagascar, the domestic water tariff is well structured . incorporating a punitive approach i.e. higher rates for higher "band" consumption. Water for irrigation is not taxed, so is waste water. Fixed charges must be paid by month, for the supply of water. They are variable according to the calibre of water meter with higher fees for greater calibre.

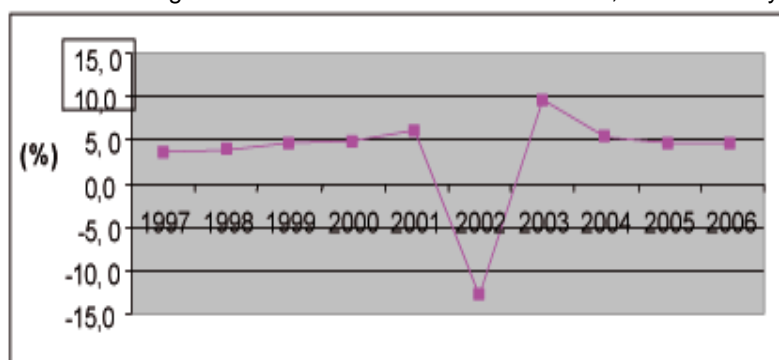
44. ECONOMIC DATA

441. Main Economic Indicators

- GDP : 5,5 billions US\$ in 2007
- GDP par habitant : 263 US\$ in 2007 (PMA)
- Rate of main activities sectors in the GDP: Primary : 28% - Secondary : 15% - Tertiary : 56%
- Growth rate : + 7.3 % in 2005
- Inflation rate : + 11.5 % in 2006 against 27.4 % in 2004
- Commercial balance: - 425 Billion US\$ in 2007

442. Evolution of the economic growth rate

The economic growth rate evolution from 1997 to 2006, is reflected by the following table:



Source: Ministry of Economy, Finance and Budget

45. ECONOMIC WATER ACCOUNTS

The access to water consolidated data is processed by the data base department of the Ministry of water and ANDEA, for all operators. Thus, according to a document of the Ministry of water,

- Access rate to potable water is 37.45% with 63.49% for urban and 30.09% for rural.
- Access rate to sanitation is 51.5%

The system carried out at the source by JIRAMA makes accounting of the water flow exploited. The annual potable water produced by JIRAMA is as follows:

- Volume of flow operated annual total 185,029,596 m³
- From surface water : 159,853,356 m³
- From ground water : 25,176,240 m³
- Rate of catchment on water resources 37.7%

Efficiency is calculable only for potable water and for JIRAMA:

- Accounting water according to the sales to subscribers : 49.458.635 m³
- Unaccounting water: 135.570.096 m³
- Efficiency : 26,7%
- RUFW : 73,3 %

The information for other catchment activities is not sufficiently structured. The effectiveness of metering systems at all levels, the effective control of the losses and consumptions fraud should improve the accounting of water consumption.

CHAPTER 5. FUTURE PERSPECTIVES

51. KEY LESSONS FROM THE EXPERIENCE OF MADAGASCAR

511. Policy, water legislation and practices

In Madagascar, a water code has been adopted since 1999 that means the willingness of the country:

- to coordinate all actions relating to the water resources management;
- to treat water as common good of the nation and thus the public field;
- to ensure its protection both quantitative and qualitative;
- to ensure the water resources conservation and the environmental protection;
- to manage the development of water resources;
- to propose a financing harmonisation of the sector by a National Fund of water resources.

Currently, ten years after, it must be noted that many of the provided status are not yet effective. The objectives related to the establishment of the ANDEA (National Water and Sanitation Authority) and the Ministry of Water at national level, are not yet achieved for in reference to the typical example by necessary authorizations before catchment projects according to the needs of the water market and the potential resource.

Decentralized activities have achieved interesting results by local water programs like WASH (Water Sanitation activities and Sanitation Authority) on 17 sites and PAEAR (Rural Water Supply and Sanitation programme) on their 8 intervention areas.

512. Empowerment of structures and mechanisms

- Clarification of implications

The whole implementation system of the water code can function well if each structure implication could be clarified in this framework, for its role and its mission. This is not the case today by quoting only ANDEA (National Water and Sanitation Authority), catchment areas agencies and JIRAMA (National Water and Electricity Utility).

- Participation in the mechanisms of involvement

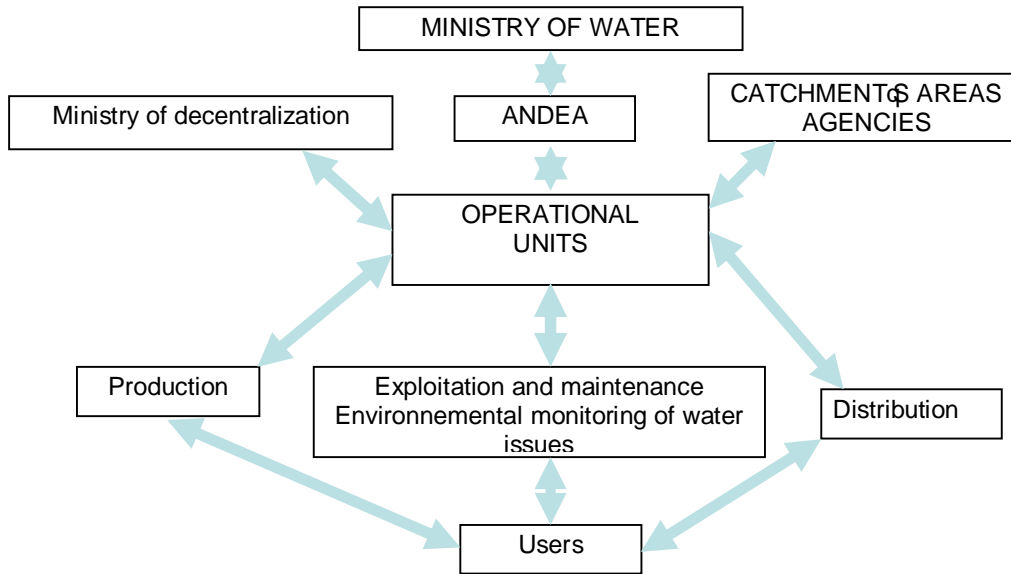
At different levels, a systematic and participatory approach by stakeholders, should also involve the mechanisms for integrated water management. So each catchment area agency which does feel well independent in its fields and it should especially be tool for the ANDEA procedures.

Lack of decision mechanisms for catchment projects monitoring can encourage their effective integration in a process IWRM.

For end users, it must be noted the importance of the awareness and mobilization around a water structured approach to reach the goals and necessary attitude changes. To this effect, the successful experiences by the initiative WASH (Water Sanitation and Hygiene) must be noted and particularly for the women play and relevant role deserved within families and schools. That can be highlighted and may be even more developed.

- *Structural Scheme*

The structural scheme and relationship for an effective IWRM process in its future development, illustrated by the following diagram, seems yet simple and fairly logical. However, it covers several levels and different modes of involvement must still well established and sometimes involving many other criteria.



Intervention units are the operational actors in their respective areas and may be different status (Public institution, engineering institutions, enterprises, decentralized community, external financed project, international or national NGOs).

- *Organization*

Organization of structures can penalize or strengthen differently their capacities. The national fund for water resources is not yet established so institutions are unsuccessful for their implementation. If resources are organized into six catchment areas by considering each individual river, water demands should consider this zoning in each catchment projects.

- *Quality Management*

Presently, the bacteriological quality control of potable water is undertaken at the central laboratory of JIRAMA and Pasteur Institute of Madagascar both based at Antananarivo, in the capital. This system request time and high costs for all process. It does not facilitate the assurance of the water quality and its potability in the different sites.

- *Production system*

Production is carried out mainly from the surface water, for 86,4% of flow operated by the JIRAMA.. Water turbidity is then lower and requires less physico-chemical treatment.

513. Better cooperation of stakeholders

• *Independence and coordination*

If each actor is well structured and strengthened to play its role in the management of resources and water uses, the stakeholders, already identified in this study, could normally work together on the same decentralized site, at the level of the catchment areas or at national level. They remain independent in their activities, but will lead of decisions and actions coordinated. It is an imperative that they can use same informations.

• *Collaboration by catchment area*

The catchment area management can normally stimulate cooperation and mobilize around the same problematic of water resources in each area. The establishment of catchment areas agencies and different local committees for each agency is interesting to strengthen the structured cooperation.

- *Collaboration for water efficiency*

The collaboration between coordination actors and operational units like irrigation projects, JIRAMA (National Water and Electricity Utility) and private operators is still to be improved. In many fields with so different approaches, householders, farmers, irrigation, industrial, hydroelectricity, tourism, the stakeholders were accustomed to work according to their own approach.

Shared objectives of production and distribution efficiency have not been set when they can serve reference and basis for cooperation between all stakeholders.

- *Financing*

Co-financing system and water fees for improving operational organization, are also inadequate.

- *Cooperation under regional or international*

Sub regional or global cooperation with outside structures for water resources management should allow benefit from similar experiences of institutions, stakeholders in their ways of involvement and for drawing key lessons.

52. FUTURE PERSPECTIVES AND THE NEED TO CONTINUE THE PROCESS

521. Next steps envisaged to continue the process

Next steps that will be planned to continue the process IWRM in Madagascar affect following points:

a) Legislation implementation :

It is necessary to improve the enforcing of rights provided by the water code and implementing decrees. It will be with the strengthening of the water sector institutions for their mission in this framework and to manage the process IWRM.

b) Major sector and IWRM :

- Hydropower must be developed because of thermal energy is more expensive;
- The potable water supply system, sanitation and hygiene, into a holistic approach for domestic needs , remains a priority with regards to health objectives of Madagascar;
- Irrigation sector especially for rice and the green revolution will have their important place in the IWRM

c) Strengthening of the water quality management :

The water contamination is source of diseases. The water quality management by mitigation of pollution sources will facilitate the availability of potable water.

d) Accounting resources water :

The Reduction of Unaccounting For Water (RUFW) is to strengthen by improving the efficiency water. To continue the process IWRM, the fees will be better recovered and the establishment of the National Fund of the water provided by the water Code.

e) Action plan :

- Decentralization of process IWRM at the level of each of six catchment areas and national coordination;
- Master Plan for each catchment area for a local process IWRM ;
- Establishment of human and technical resources Center of the water and sanitation within the CNEAGR (National Center for Water, Sanitation and Rural Engineering) with material and financial support from UNICEF and the international NGO Water Aid. This Center will provide information, training, equipment and technicians in the field of water and sanitation, at lower cost ;
- Maintenance and rehabilitation of existing infrastructure which are out dated.

522. Main obstacles

The main obstacles can be identified as follows:

- Because of the fact that Madagascar is covering a large area, spatial dispersion of the population users makes difficult the water allocation and its quality management;
- Lack of metering system water river for the inventory of resources, something which penalize the monitoring of these resources with climate change, uses and losses;
- Scarcity and the weakness of financing which have been obtained by the water sector ;
- Obsolescence of production infrastructure and lack of distribution facilities, lead to a lack of production and the unavailability of material for connection ;

523. Value added for Madagascar by partnership with GWP or GWP-SA

The acknowledgement of the implementation and planning problems in water sector and key lessons drowned by different countries is the most important added value by partnership with GWP or GWP-SA. In the past, when the Department of energy and mines has been responsible for the water sector, it has submitted a request for partnership to the SADC for the strengthening of its water data basis. This request has been remained without action because of its unregional character.

It must be noted it is national action but it needs to integrate regional networks for sharing experiences of mechanisms, information, tools and instruments used for capacity building. The regional monitoring in relation to the global planned objectives can also improve IWRM implementation and practice in the country. Different forms of financial support to the water sector, for accounting water system and improvement of efficiency water with regards to ways and means sited up by other countries, are steps in the partnership with the GWP or the GWP- SA.

53. CONSTRAINTS, OPPORTUNITIES AND PERSPECTIVES

531. Strategic and practical constraints

a. Strategic :

- Lack of actions plans coordinated in the water sector into the partnerships;
- Inadequacy of the financing of the water sector for sustainability of IWRM process;
- Decentralization is not yet effective in many areas to satisfy the demands which are scattered in the large land of Madagascar. Monitoring from central structure is difficult and expensive if it is always.

b. Practical :

- The limitropic and piezzometric metering system are inadequately carried without equipment and programs of new measuring stations;
- Financing and data collection mechanisms and other procedures are not yet effective.

Normally, catchment areas must be financed by the National Fund for Water Resources (FNRE) or by the government fund, but each agency also has the possibility to negotiate with funds or foreign aid since it is with an autonomy of management. It is a public establishment an administrative nature autonomous. UNDP has contributed to a punctual financing. BAD is requested for studies of planned scheme patterns by each catchment area.

Madagascar proposes to strengthen this approach by the low level but remains convinced that regional cooperation can also strengthen its approaches. The unsatisfied needs in the water sector are still very great while the potential resources are sufficient.

532. Opportunities to strengthen the IWRM process

Account of the different aspects raised on the national situation of the process IWRM in Madagascar, opportunities to strengthen concern the following aspects:

- The enforcing implementation of the water code;
- Capacity building for implementation and partnership;
- WASH experiences especially for local awareness, women and scholar role;
- Networks of specialized water databases;
- Monitoring at the level of agencies and committees catchment areas;
- Strengthening of financial Partnership to meet the water market
- Environmental approach of water sector

533. Perspectives et recommandations

a) Improvement of the rate of water servicing :

PAEAR (Rural Water Supply and Sanitation Program), in its rural areas, can achieve the objective of coverage rate of 50% on the basis of 35% in their intervention areas.

The objective of JIRAMA (National Water and electricity Utility) is a water coverage rate of 95% in urban areas and 53% in rural areas by 2012 according to the MAP (Madagascar Action Plan 2007-2012).

The following work is then recommended for achieving these objectives of serving by 2012 :

- Production of additional resources 249, 500 m³/day
- Extension of the stations treatment capacity by 214 , 300 m³/day;
- Add reservoirs of total capacity of 48 , 800 m³ ;
- Extension of distribution pipes of 878 km long (diameter variant of 75mm to 250mm).

The future needs for a better contribution of the JIRAMA on the achievement of objectives for the accessibility of potable water for the population are reflected in investment necessary to 513 million USD whose 83,5% investment of production and 15,7% investment of distribution.

Now, the water utilization by JIRAMA represents only 37.7% of total received water resources through rainfall. This percentage can go up 56.3% by additional production.

b) Partnership :

The effective coordination of actions between all actors in the water sector in the process IWRM is eagerly awaited with the increase in the active participation of financial partners to the achievement of objectives. The collaboration at the level of watersheds is strongly recommended to allow for the coordination of by the ANDEA (National Water and Sanitation Authority) at national level. The catchment area agency is the first responsible for the IWRM establishment in its fields.

534. Conclusion and final appreciations

Referring to IRWM basic guiding principles:

- a. The holistic approach making the link between the social and economic in different uses is more or less defined in the water code. But its vision must still be shared by all stakeholders to serve as overall framing effective.
- b. The involvement of women in providing, managing and safeguarding water resources is done through their role in the various local committees, their influence in the attitude changes at the level of families according the experiences of the initiative WASH. For the management of potable water, sanitation and hygiene are particularly for women who are penalised for search of the water very far, who are affected by the deaths of their children, because of diseases linked to water.
- c. The economic value of the water irrespective of its use is still being penalized in Madagascar by the lack of balance between the public good that is the water and the recovery of royalties and costs. Madagascar must be strengthened on this point and improve the efficiency for the effective conduct a plan of action national IWRM

Each actor being well structured and strengthened to play its role in the management of resources and uses of water, stakeholders identified during the evaluation could normally work together on decentralized sites or national. They remain independent but pursue coordinated actions for, at least, work on the same information and toward the same objectives.

The catchment area management by each catchment area agency and its committees with decentralized mechanisms is a real opportunity for empowerment of IWRM process but it needs better collaboration which must be strengthened.

The collaboration between the actors of coordination and the local intervention units and private operators are still to improve, more so because of the various stakeholders were accustomed to working according to their own approach.

Enforcing of the laws is imperative to develop IWRM in Madagascar with support of effective practices and partnerships in that framework, shared objectives of efficiency and improving RUFW program, strengthening of stakeholders in the water sector.