

LTBP

Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika

Strategic Action Plan

Burundi

Conclusions of the National Consultation preceding the TDA :

**National Diagnostic Analysis, National Environmental Priorities and Strategies
Review**

**8 November 1998
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1. Background: NDA, NEPSR and the SAP

One of the (LTBP) project objectives is to establish a regional management plan to control pollution and protect biodiversity of Lake Tanganyika.

The approach adopted for this management objective is the Strategic Action Plan (SAP) based on the idea that management plans have to be revised in response to changing circumstances. The SAP will set up a management framework and will define a revisable plan of interventions classified by priorities .

The process of developing the SAP is made up of seven steps, three steps at the national level and four at the regional level:

a) National level :

National NWG Planning Meeting
NDA, National Diagnostic Analysis
NEPSR, National Environmental Priorities and Strategies Review.

b) Regional level:

Technical Advisory Committee Meeting
TDA, Transboundary Diagnostic Analysis
Preparation of the draft SAP
Signature of SAP

The NDA and NEPSR precede the TDA which they prepare. The current report aims to account for the national process especially for the NDA and NEPSR of Burundi and to present the outputs.

2. Objectives of the NDA- NEPSR National Consultation

The objective of the four national consultations (NDA-NEPSR) is to provide a similar level of background preparation to the four countries delegations, in view of the TDA and the SAP. The national consultation of Burundi must therefore contribute to the putting together of the four diagnosis, helping at the same time the Burundian delegation to express the interests and special concerns of their country.

Therefore, the specific objectives of the NDA-NEPSR process were the following:

1. To complete the three levels of the « Analytical Problem Matrix » on the basis of the diagnosis of the lake biodiversity problems (NDA) and the review of proposed actions account relating to policies, strategies and legislation and institutional measures existing at national level (NEPSR). The three levels are the following :

Level 1. Main biodiversity problems (in principle Pollution, Sedimentation, Fisheries), transboundary implications, underlying institutional causes, related action areas.

Level 2 : Proposal of measures : by action area, specific problems, related stakeholders, uncertainties (needs of investigations and additional studies), actions to be proposed.

Level 3 : For each action: timing, key agency, availability of human and material resources.

2. To prioritise the identified specific problems (five within each general action area).

3. Progress

3.1. Planning meeting

The NWG planning meeting was held in Bujumbura on 30 June 1998. A programme was prepared including a proposal of participants, tasks distribution, as well as dates and venue for NDA and NEPSR. Only minor changes occurred afterwards to the overall planning.

3.2. TDA

The TDA workshop was held in Bujumbura from 7 to 11 September 1998. It followed the steps and carried out the following tasks :

1. Opening and introduction
2. Presentation by subject
3. Matrix Level 1
4. Analysis of specific problems and prioritisation
5. Identification of stakeholders and detail of actions related to priority problems.

3.3. NEPSR

The NEPSR was held in Bujumbura from 2 to 6 November 1998. It followed the steps and carried out the following tasks :

1. Opening and introduction
2. Presentation by subject
3. Review of Matrix Level 1
4. Review of specific problems, actions and justification of priorities
5. Identification of stakeholders and detail of action related to priority problems
6. Identification of issues of special transboundary interest, to be presented to the TDA

3. Outputs

3.1. Texts presented

The topics presented were the following :

a) TDA (September)

Biodiversity and Lake Tanganyika
Catchment (land use, erosion)
Human settlements, towns and industries
Fishing
Public works, mines and quarries
Problems specific to Rusizi plain
Institutions, legislation, education
Socio-economic inputs of the lake

a) NEPSR workshop (November)

Lake transport (remainder of TDA)
Water pollution (remainder of TDA)
Laws on hydraulic public domain and waste disposal
National water master plan
Draft law on fisheries
National population policy
Urban development policy
Environmental coordination

Presentations were compiled and given to the NC.

3.2. The three level analytical matrix

The completed matrix is given in annexe 1 of the present document.

The matrix calls for the following comments:

Level 1 :

1. To the three groups of problems for major intervention (pollution , sedimentation, fishing) was added the issue of protection of the supra littoral area, which is under particular pressure in Burundi.

Level 2 :

The list of stakeholders is an open list, supposed to indicate different agencies and concerned groups, without anyway prejudge their commitment. NGOs, local associations and communities are not specifically cited, because not all of them are identified or are always very stable.

Level 3 :

Writing conventions are as follows : Y = Yes = Resources available, N = No = Resources not available (but not nil). Resources are considered as available when they are sufficient to start the action, even at reduced scale. The mention « insufficient » means that additional resources are however necessary to conduct the action up to the wished level.

At this stage, actions are considered one by one, independently of the others. The fact that resources are indicated as available in the case of one or several actions of a same key agency , means that they are available for each of them without the others and not necessarily for the whole set of those actions.

3.3. Priorities

The specific problems have been listed in two categories: C (Current) and P (Potential). Considered as P are the actions or the environmental modifications that are likely to happen in the future, or that currently happen without being aware of their destructive characteristics for the biodiversity of lake Tanganyika.

Secondarily, the listed C problems are prioritised in each of the general action areas taken separately. The criteria of prioritisation are :

1. The seriousness of the problem to the biodiversity of the lake
2. The feasibility of the solution to the problem
3. Additional benefits awaited from the solutions to the problem , from the point of view of sustainable development.

The results are presented as follows:

- Classification C / P : in the second column of matrix level 2 (see annex 1)
- Prioritisation (at least for C problems) : by a number in the same column.
- Justification and explanation of priority criteria for the 5 main problems in each of the three general action areas : see separated table in annex 2)

3.4. Subjects of special Transboundary dimension

Every problem or action affecting the lake Tanganyika concerns jointly the four countries and has a transboundary dimension, justifying cooperation, notably in sharing experience or information between the four countries. However, some problems and topics of action have additional and special transboundary dimension that would justify particular attention within the TDA. These topics are presented hereafter :

Quotas, fishing agreements, harmonisation of fishing regulations
Trade of fish (ornamental fish , living exotic fish, fishing produce)
Trade of water hyacinth
Trade of hazardous products (Basle Convention)
Protected area of Rusizi
Transfer of recycling experience from Sosumo to Kiliba (DRC) and rehabilitation of Rusizi
Agreements on oil exploitation
Upstream part of Rusizi catchment (DRC, Rwanda) : import of pollutants and sediments
Regulation of lake at the outlet (Lukuga)
Cooperation in case of transport accident, common acquisition of intervention materials
Harmonisation of regulations about lake transport
Increase and movement of population

The Burundian NWG wishes also that Rwanda becomes a stakeholder of the SAP, notably because :

- Western part of Rwanda belongs to lake Tanganyika catchment and has non negligible influence over the lake,
- Despite its position at the upstream, Rwanda can benefit from Lake Tanganyika protection system through fish importation and through conservation measures of Lake Kivu that RDC could implement in the framework of Lake Tanganyika protection.

ANNEX 1. ANALYTICAL PROBLEM MATRIX (BURUNDI)

LEVEL 1

Main threats to Biodiversity	Transboundary Implications	Main Institutional Problems	General Action Areas
<p>Major problems :</p> <p>A. Pollution</p> <p>B. Sedimentation</p> <p>C. Impact of Fishing</p> <p>Less important problem:</p> <p>D. Alteration of the supra littoral area</p>	<p>Loss of quality of water shared between the four countries</p> <p>Loss of shared fisheries resources</p> <p>Loss of regional and global biodiversity</p>	<p>Too many institutions, lacking of coordination, means, and awareness of problems</p> <p>Existing regulations sometimes obsolete, unsuitable, lacking of by-laws or effectiveness</p> <p>Development of institutional and legislative framework (code of environment) on going but not yet achieved</p>	<p>A. Control Pollution</p> <p>B. Control Sedimentation</p> <p>C. Reduce Impact of Fishing</p> <p>D. Protection of the supra littoral area</p>

LEVEL 2**Action Area : A. Control Pollution**

Specific Problem	Potential Current/ Potential	Priority	Stakeholders	Uncertainties	Proposed Actions
A1. Pollution from Bujumbura town (industrial and domestic effluents, solid and liquid waste, discharge of untreated waste, Buterere disposal site, pollution of the water table, direct dumping of waste into the lake)	C	1A	MINATE (DG ATE , INECN), Mayor (SETEMU), MCIT, Enterprises, CCIB, Regideso, MTPE, MSP, BBN, NGOs, Local associations and communities	Scale of pollution, pollutant discharges and impact on biodiversity Commendable standards	A1.1. Pre-treatment of industrial sewage and put to work the water treatment plant A1.2. Expansion of the treatment capacities A1.3. Set up controlled site disposal and collect waste A1.4. Treatment, recycling and development of waste A1.5. Improve industrial procedures A1.6. Raise awareness and train A1.7. Regulations for facilities likely to pollute (Prior EIA technical specifications) A1.8. Regulations for marketing of dangerous products for environment (notably batteries) A1.9. Develop standards for enforcement of legislation relating to waste

					<p>A1.10. Implement land use plans in the framework of planning schemes (including regulations for burial sites)</p> <p>A1.11. Strengthen capacities for INECN to monitor and control</p> <p>A1.12. Support development of secondary urban centres</p> <p>A1.13. Surveying pollution and impact levels, supervision</p>
A2. Presence of water hyacinth near the lake (risk of introduction or extension)	C	2	Producers, Traders, MINATE (INECN), Population (purchasers), Territorial administration, local associations and communities,	<p>Locating sites of the species</p> <p>Impact of possible introduction</p>	<p>A2.1. Inventory of water hyacinth sites</p> <p>A2.2. Evaluate risk</p> <p>A2.3. Raise awareness</p> <p>A2.4. Identify alternatives</p> <p>A2.5. Regulations geared to the phasing out of water hyacinth</p>

A3. Overflow of Bujumbura rivers	C	5	MINATE, MTPE, INECN), Mayor (SETEMU), Territ. Adm., MAE, MEM, MCIT, Industrial enterprises, NGOs, local associations and communities	Sensitive areas and their pollutants	<p>A3.1. Adequate planning of Bujumbura rivers and catchment, (including studies e.g. EIA)</p> <p>A3.2. Mapping damaged or sensitive areas in the catchment</p> <p>A3.3. Mapping risky zones in town</p> <p>A3.4. Identify nature of risks (i.e. concerned pollutants)</p> <p>A3.5. Regulations for risky zones</p> <p>A3.6. Control quarries and other activities on rivers</p> <p>A3.7. Regular maintenance of streams and drains</p>
A4. Fertilisers and pesticides in industrial farms near the lake (cotton, rice, palm tree)	C	4	MAE, MINATE (INECN), MST (INSP), Inputs sellers, Manufacturers, NGOs, Local associations and communities, Farmers	<p>Impact on biodiversity</p> <p>Standards</p> <p>Nature of active substances in use</p> <p>Alternate agricultural techniques</p>	<p>A4.1. Regulations on import and trade of pesticides</p> <p>A4.2. Check enforcement of existing laws trade of pesticides</p> <p>A4.3. Support integration between agriculture, forestry and animal husbandry, organic fertilisation and biological or integrated struggle</p> <p>A4.4. Train and raise awareness for supervisors and farmers</p> <p>A4.5. Improve utilisation techniques of pesticides</p>

					A4.6. Monitor pollution and evaluate impact
A5. Harbour and ship pollution and (chronic and accidental, transport of hazardous products)	C	3	MTPET (Lake transport), Ship owners, EPB, INECN – MINATE (INECN), MCIT, Lake Guard	Scale of threats : nature and quantity of products, discharge, conformity of ships to security standards	A5.1. Promulgation of Lake Traffic Act, and extension A5.2. Control enforcement of Act, and continue technical checking of ships A5.3. Evaluate scale of the problem of lake pollution A5.4. Harmonise regulations and supervising activities in riparian states A5.5. Measures of intervention in case of accident, and acquisition of equipment (in cooperation between the four countries) A5.6. Establish a shipyard for maintenance and repairing of ships
A6. Town effluents and coastal industries outside Bujumbura (especially in Rumonge)	C	6	MINATE (INECN), Territ. Admin., MCIT, Enterprises, CCIB, MTPE, NGOs, local associations and communities	Nature and quantity of effluents Impact of pollutants on biodiversity	A6.1. Pre- treatment of industrial water waste, establish system of collecting water waste (household and industrial) and construction of water treatment plants A6.2. Setting up controlled disposal sites and collect waste

					<p>A6.3. Improve industrial procedures</p> <p>A6.4. Raise awareness and train</p> <p>A6.5. Raise awareness and supervise local oil and soap factories, and recycle their waste</p>
					<p>A6.6. Regulations for the facilities</p> <p>A6.7. Strengthen capacities for INECN to monitor and supervise</p>
A7. Fertilisers and pesticides, outside industrial cultures near the lake	C	8	MAE, MINATE (INECN), MST (INSP), Inputs sellers, Manufacturers, NGOs, Local associations and communities, Farmers		A4.1 to A4.7.
A8. Cattle concentration along the lake (faeces, acaricides, other veterinary	C	7	Cattle farmers, associations of cattle farmers, MAE, Territ. admin., Mayor, SOBEL,	Impact on the lake (quantity and nature of pollutants, problem caused by AVICOM, effects on lake biodiversity)	<p>A8.1. Identify and plan adequate sites</p> <p>A8.2. Make regulations for facilities</p> <p>A8.3. Raise awareness</p> <p>A8.4. Evaluation of impact</p> <p>A8.5. Recovering of faeces from intensive breeding (fertilisation, biogaz)</p>

products)			AVICOM, MINATE (INECN), UB (FACAGRO), ISABU, MEM	Future development of the phenomenon, hypothetical return to original sites	
A9. Growth of Bujumbura population (rural depopulation)	C	9	MTPE, NGOs, Local associations and communities, MEM (DMC), Gold washers		A9.1. Support development of secondary urban centres A9.1. Support rural development
A10. Pollution of Rusizi by gold mines	C	10	MEM (DMC), Gold washers	Toxic metal content in effluents and impact on lake	A10.1. Dosage and evaluation of seriousness of pollution A10. >1. See B6.1 to B6.4.
A11. Potential pollution and eutrophication by Gakara rare land mines (discharge of phosphates)	P	>10	MEM (DMC), MINATE, Mining company	Scale of pollution and effects on lake	A11.1. EIA prior to start mining

A12. Potential pollution by Musongati nickel mines	P	Id.	MEM (DMC), MINATE, Mining company	Incidence on lake of possible exploiting, via Malagarazi	A12.1. EIA prior to start mining
A13. Fallout of atmosphere pollution	P	Id.	MINATE (INECN), MCIT	Impact on lake	A13.1. Evaluate impact
A14. Expansion of floating plants	C	Id.	MINATE (INECN), ISABU, UB	Solutions, expansion speed, scale of problem, impact	A14.1. Continued watching A14.2. Search for solutions, feasibility study of one collection of plants in order to utilise as fertilisers, exchange experience with countries which face the same kind of problems
A15. Effects of possible exploration and exploitation of hydrocarbons	P	Id.	MEM, Oil company, MINATE (INECN)	Impact on lake, Transboundary effects	A15.1. Review Oil and Mines Act in order to take into account environmental impacts A15.2. Negotiate agreements with other riparian countries

Action Area : B. Control Sedimentation

Specific Problem	Potential / Current /	Priority	Stakeholders	Uncertainties	Proposed Actions
B1. Unsuitable farming practices (including farming of non protected steep slopes)	C	1	MAE, MINATE, Territ. Admin., Farmers, ISABU, UB (FACAGRO), MTPE, NGOs, Local associations and communities	Impact on biodiversity, scale of sedimentation, relation between erosion and fragile areas receiving sediments at lake level	<p>B1.1. Evaluate impact of problem and identify more accurately erosion areas generating higher risks over lake biodiversity</p> <p>B1.2. Plan catchment (agro-forestry, anti-erosive practices), raise awareness and promote participative approach</p> <p>B1.3. Research – development and extension of suitable techniques</p> <p>B1.4. Planning focused on sediment deposits in the valleys, traps for sediments</p> <p>B1.5. Define special standards and prioritise interventions to areas identified under B1.1</p>

B2. Clearing forests and natural woods (protected areas)	C	2	MINATE (INECN), MINATE (Dep. of forestry), Territ. Admin., Population, NGOs, Local associations and communities	Scale and distribution of clearings State of resource	<p>B2.1. Strengthen legal basis for Protected Areas</p> <p>B2.2. Expansion of network of Protected Areas to cover all natural forests</p> <p>B2.2. Update Forestry and Land Act (notably by making regulations for trade of forest products), harmonise with Environment Act</p> <p>B2.3. Compensate people expelled from PAs when they are set up</p> <p>B2.4. Demarcate and materialise PAs boundaries</p> <p>B2.5. Demarcate and materialise national forests boundaries</p> <p>B2.6. Inventory of forests and evaluate damage</p> <p>B2.7. Rehabilitation of destroyed parts of PAs</p> <p>B2.8. Rehabilitation of destroyed woods</p> <p>B2.9. Environmental education (at all levels)</p> <p>B2.10. Prepare PAs management plans with participative approach (community management) and identify alternative resources</p>
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					<p>B2.11. Prepare participative management plans for woods</p> <p>B2.12. Promote agroforestry and private woods</p> <p>B2.13. Reinforce supervision of PAs and INECN capacities</p> <p>B2.14. Reinforce supervision of woods</p>
B3. Bush fires	C	5	Population, Territ. Admin., MAE, MINATE (INECN, Dep. of Forests), NGOs, Local associations and communities	<p>Impact on lake biodiversity</p> <p>Rationale for efforts of total suppressing of fires</p>	<p>B3.1. Raise awareness of population</p> <p>B3.2. Set up preventive measures for intervention</p> <p>B3.3. Check enforcement of law</p> <p>B3.4. Studies geared to respond to uncertainties</p>
B4. Direct disruption of rivers (including their banks) and quarries	C	3	MEM, Territ. Admin., (communes), MTPE, SETEMU, MINATE	<p>Impact (volume, ecological consequences)</p>	<p>B4.1. Review Act n° 1/40 of 18 December 1991 (provision for taking into account of EI and site restoration)</p> <p>B4.2. Intersectoral consultation according to law prescription</p>

			(INECN), Quarries developers, Construction companies		B4.3. Designate alternative working sites B4.4. Raise awareness B4.5. Expand powers for DMC to supervise small workers B.4.6. Plan sanitation network of Bujumbura B4.7. Inventory of quarries and exploitable deposits B4.8. Control and monitor land reclamation
B.5. Erosion from roads and rural trails	C	4	MTPE, MDC, Territ. Admin., MINATE (INECN), NGOs, Local associations and communities	Scale of impact	B5.1. EIA and monitor new road projects B5.2. Prepare environmental guidelines for minor projects non subjected to EIA (rural trails) ; extension of these guidelines B5.3. Mobilise and raise awareness of population to maintain rural trails and paths B5.4. Make-up existing road banks (stabilise slopes, plan hydrous discharge, control torrents)
B6. Gold panning	C	8	Gold washers, Counters, DMC, Territ.	Impact on lake biodiversity	B6.1. Raise awareness of DMC and territorial administrations B6.2. Organise gold washers into

			Admin., MINATE (INECN)		associations B6.3. Strengthen capacities for DMC to control and supervise B6.4. Translate in Kirundi and disseminate technical standards for work and land reclamation
B7. Overgrazing	C	7	MAE, MINATE, Cattle farmers, Associations of cattle farmers, NGOs, Local associations and communities		B7.1. Clarification about land use B7.2. Promote permanent stalling and breeding of improved species B7.3. Raise awareness of cattle farmers
B8. Mines of rare land and nickel	P	10	MEM, Mining companies		B8 : see A12
B9. Inappropriate forestry practices	C	9	MINATE (Dep. of forestry), ISABU	Suitable forestry species, impact of species on land conservation	B9.1. Try forestry species that protect land B9.2. Multiplication of those suitable species B9.3. evaluate impact, erosion actions

B10. Erosion caused by habitat	C	6	MTPE, MRRR, NGOs, Local associations and communities (communes), Workers, Building companies, INECN, MTPE		<p>B10.1. Review urban centres classification and recognition of new towns</p> <p>B10.2. Urban centres planning scheme (anticipate land use plans, and retention measures of land and sediment)</p> <p>B10.3. Promote techniques for rain water control in rural areas</p> <p>See also B2 and B4</p>
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Action Area : C. Control Fishing

Specific Problem			Stakeholders	Uncertainties	Proposed Actions
C1. Excessive fishing (specially along the littoral), including non observation of fishing periods	C	1	Fisheries administration (including MAE-fisheries Department and Territorial Admin.), Fishermen, Owners of fishing units, MINATE (INECN), NGOs, Local associations and communities, UB	Potential of resource	<p>C1.1. Strengthen capacities for Fisheries Dep. to control and supervise</p> <p>C1.2. Raise awareness and train (fishermen, boat owners, administration)</p> <p>C1.3. Ascertain potential, fishing standards and acceptable licensing quotas</p> <p>C1.4. Resort to the Environment Fund and maintain the fund by tax raising on fish</p> <p>C1.5. Support other income generating activities or those that supply animal proteins</p> <p>C1.6. Update and issue draft law and by-laws, as well as ordinances</p> <p>C1.7. Translation in Kirundi and extension</p>
C2. Use of inappropriate gear (nets with small mesh size, mosquito nets, explosives, poisons, fish traps)	C	2	Fisheries admin., (incl. MAE-Dep. of Fisheries, Territ. admin.), Fishermen, Importers and gear manufacturers,	Scale of problem	<p>C2.1. Evaluate scale of problem</p> <p>C2.2. Review and issue draft Act and adopt by –laws (with introduction of more realistic mesh size, around 20mm)</p> <p>C2.3. Translation of Act in Kirundi and extension</p>

			Forces of law and order, UB, MINATE (INECN), NGOs, Local associations and communities		C2.4. Monitor and supervise C2.5. Raise awareness and train C2.6. Encourage fishermen to group into associations (incl. small fishermen)
C3. Fishing in spawning areas and nursery grounds	C	3	Fisheries Adm., (including MAE-Fisheries dep., Territ. Adm.) , Fishermen, MINATE (INECN), NGOs, Local associations and communities	Localisation of spawning areas Scale of extraction and impact	C3.1. Inventory of more sensitive spawning areas C3.2. Review draft law, promulgation, translation, extension C3.2. Strengthen control and watching insensitive spawning areas (Murembwe, Nyengwe, Rwaba and others to be identified) C3.3. Raise awareness (at all levels)
C4. Trade of ornamental fish	C	4	MINATE (INECN), MAE (Fisheries dep.), Exporters, Sellers, Customs, BRB, NGOs, Local associations and communities	Scale of problem and impact	C4.1. Prepare list of threatened species and proposal of inclusion in CITES lists C4.2. Regulations, control, monitoring C4.3. Encourage fish farming of those species C4.4. Raise awareness C4.5. Set up protected areas (demarcation, watching, eco - tourism development, prepare management plans)

C5. Risks linked to the of introduction of exotic species that can disrupt ecological balance	C	5	MAE (Fisheries dep.), Development projects (fish farming), MINATE (INECN), Customs, Sellers of living fish, NGOs, Local associations and communities	Localisation farming sites for exotic fish in the catchment Scale of problem	C5.1. Inventory of fish farming sites, evaluation of risk C5.2. Follow up of population of introduced species (Ruzizi cichlide) and evaluate risk C5.3. Control entrance of species in the country C5.4. Regulations
C6. Increasing of floating plants due to the passing through of boats	C	4	Fishermen, Boat operators, MAE (Fisheries Dep.), MINATE (INECN), MTPET, NGOs, Local associations and communities	Solution of the problem Scale of problem and speed of expansion	C6.1. Feasibility study for collecting those plants and their use in organic fertilisation (exchange of experience) C6.2. Apply results, by priority in the areas of the passing through of boats C6.3 Raise awareness of boat operators C6.4. Supervise
C7. Extraction of young fish mukéké (<i>Laters stapersi</i>) mixed with adults ndagalas	C	6	Fishermen, MAE (Fishing dep.)		C7.1. Introduce fishing periods C7.2. Control C7.3. Raise awareness

Action Area : D. Protection of the semi liable to flooding area along the lake (supra littoral area)

Specific Problem	Potential Current/ Potential	Priority	Stakeholders	Uncertainties	Proposed Action
D1. Agriculture	C	3	Mae (incl. Fishing dep.), MINATE (INECN), Territ. Adm., Farmers, NGOs, Local associations and communities	Cultivated surface and Impact	D1.1. Mapping supra littoral area and cultivated area D1.2. Raise awareness D1.3. Participative management and non destructive recovering of natural resources D1.4. Isolate sensible areas as protected areas (Murembwe, Nyengwe, Rwaba)
D2. Cattle breeding (grazing, disturbance...)	C	4	MAE (incl. Fishing dep.), MINATE (INECN), Territ. Adm., Cattle breeders, NGOs, Local associations and communities	Scale of problem, impact	See D1.2, D1.3., D1.4.

D3. Fishing and poaching	C	5	MINATE (INECN), MAE (Fishing dep.), Territ. Adm., Fishermen, NGOs, Local associations and communities		See D1.2, D1.3., D1.4. and C1, C2, C3
D4. Sand extraction	C	8	MINATE (INECN), MEM (DMC), REGIDESO, MAE (Fishing dep.), Territorial Adm.		D4.1. Control sand extraction D4.2. Raise awareness See D1.3., D1.4.
D5. Reed cutting for varied constructions	C	7	MINATE (INECN), MAE (Fishing dep.), Territ. Adm., NGOs, Local associations and communities		D5.1. Control reed exploitation

D6. Burn cultivation (solid waste disposal : see pollution)	C	9	MINATE (INECN), MAE (Fishing dep.), Territ. Adm., NGOs, Local associations and communities		D6.1. Banning
D7. Habitat and industry extension	C	4	MINATE, MTPE, MDC, MAE (Fishing dep.), Territ. Adm., NGOs, Local associations and communities		D7.1. Land use plans
(Solid waste disposal: see Pollution)					

LEVEL 3 : Detail of actions

Proposed Actions	Timing	Key Agency	Human	Material
Pollution				
A1.1. Pre-treatment of industrial sewage and put to work the water treatment plant	Ac. to resources	Mayor (SETEMU)	N	N
A1.2. Expansion of the treatment capacities	> 1.1.	Mayor (SETEMU)	N	N
A1.3. Set up controlled site disposal and collect waste	Ac. to resources	Mayor (SETEMU)	N	N
A1.4. Treatment, recycling and development of waste	Ac. to resources	Mayor (SETEMU)	N	N
A1.5. Improve industrial procedures	Ac. to resources	MCIT	N	N
A1.6. Raise awareness and train	Ac. to resources	MINATE (INECN)	N	N
A1.7. Regulations for facilities likely to pollute (Prior EIA technical specifications)	Ac. to resources	MINATE (INECN)	N	N
A1.8. Regulations for marketing of dangerous products for environment (notably batteries)	Possible now	MINATE	Y	Y
A1.9. Develop standards for enforcement of legislation relating to waste	Ac. to resources	MINATE	Y insufficient	N
A1.10. Implement land use plans in the framework of planning schemes (including regulations for burial sites)	Ac. to resources	MTPE	Y insufficient	Y insufficient
A1.11. Strengthen capacities for INECN to monitor and control	Ac. to resources	MINATE (INECN)	N	N

A1.12. Support development of secondary urban centres	Ac. to resources	MTPE	N	N
A1.13. Surveying pollution and impact levels, supervision	Ac. to resources			
A2.1. Inventory of water hyacinth sites	Ac. to resources	MINATE (INECN)	N	N
A2.2. Evaluate risk	Ac. to resources	idem	N	N
A2.3. Raise awareness	Ac. to resources	idem	N	N
A2.4. Identify alternatives	Ac. to resources	idem	N	N
A2.5. Regulations geared to the phasing out of water hyacinth	Possible now	idem	N	N
A3.1. Adequate planning of Bujumbura rivers and catchment, (including studies e.g. EIA)	On going, extension ac. to resources	MINATE-MTPE	Y insufficient	Y insufficient
A3.2. Mapping damaged or sensitive areas in the catchment	On going, extension ac. to resources	MINATE	Y	Y insufficient
A3.3. Mapping risky zones in town	Possible now	MTPE	Y	Y insufficient
A3.4. Identify nature of risks (i.e. concerned pollutants)	Possible now	MINATE (INECN)		
A3.5. Regulations for risky zones	>A3.2	MINATE-MTPE	Y	Y
A3.6. Control quarries and other activities on rivers	Ac. to resources	MEM (DMC)	Y	N

A3.7. Regular maintenance of streams and drains	Ac. to resources	MTPE	Y	N
A4.1. Regulations on import and trade of pesticides	Possible now	MINATE	Y	Y
A4.2. Check enforcement of existing laws trade of pesticides	Possible now	MSP	Y	Y insufficient
A4.3. Support integration between agriculture, forestry and animal husbandry, organic fertilisation and biological or integrated struggle	On going, extension ac. to resources	MAE	Y	Y insufficient
A4.4. Train and raise awareness for supervisors and farmers	On going, extension ac. to resources	MAE	Y	Y insufficient
A4.5. Improve utilisation techniques of pesticides	On going, extension ac. to resources	MAE	Y	Y insufficient
A4.6. Monitor pollution and evaluate impact	On going, extension ac. to resources	MINATE (INECN)	Y	Y insufficient

A5.1. Promulgation of Lake Traffic Act, and extension	Possible now	MTPET, Government	Y	Y
A5.2. Control enforcement of Act, and continue technical checking of ships	>A5.1	MTPET	Y	N
A5.3. Evaluate scale of the problem of lake pollution	Ac. to resources	MINATE (INECN)	N	N
A5.4. Harmonise regulations and supervising activities in riparian states	Ac. to resources	MTPET	Y	N
A5.5. Measures of intervention in case of accident, and acquisition of equipment (in cooperation between the four countries)	Ac. to resources	MTPET	N	N
A5.6. Establish a shipyard for maintenance and repairing of ships	Ac. to resources	MTPET	N	N
A6.1. Pre- treatment of industrial water waste, establish system of collecting water waste (household and industrial) and construction of water treatment plants	Ac. to resources	Min. Interior	N	N
A6.2. Setting up controlled disposal sites and collect waste	Ac. to resources	Min. Interior	N	N
A6.3. Improve industrial procedures	Ac. to resources	MCIT	N	N
A6.4. Raise awareness and train	Ac. to resources	MCIT	Y	N

A6.5. Raise awareness and supervise local oil and soap factories, and recycle waste	Ac. to resources	MCIT	Y	N
A6.6. Regulations for the facilities	Ac. to resources	MCIT	N	Y insufficient?
A6.7. Strengthen capacities for INECN to monitor and supervise	Ac. to resources	MINATE (INECN)	Y insufficient	N
A7.1 to A7.7: see A4.1 to A4.7				
A8.1. Identify and plan adequate sites	On going, extension ac. to resources	MAE	Y	Y
A8.2. Make regulations for facilities	Possible now	MAE	Y	Y
A8.3. Raise awareness	Possible now	MINATE	Y	Y
A8.4. Evaluation of impact	Ac. to resources	MINATE (INECN)	Y	N
A8.5. Recovering of faeces from intensive cattle farming (fertilisation, biogas)	Ac. to resources	MAE	N	N
A9.1. Support development of secondary urban centres	Ac. to resources	MTPE	Y insufficient	N
A9.1. Support rural development	Ac. to resources Ac. to resources	MDC	Y insufficient	N

A10.1. Dosage and evaluation of seriousness of pollution A10. >1. See B6.1 to B6.4.	Ac. to resources	MINATE (INECN)	Y insufficient	N
A11.1. EIA prior to start mining (Gakara)	Ac. to projects	MINATE	Y insufficient	Y
A12.1. EIA prior to start mining (Musongati)	Ac. to projects	MINATE	Y insufficient	Y
A13.1. Evaluate impact	Ac. to resources	MINATE (INECN)	Y insufficient	N
A14.1. Continued watching A14.2. Search for solutions, feasibility study of one collection of plants in order to utilise as fertilisers, exchange experience with countries which face the same kind of problems	Ac. to resources Ac. to resources	MINATE (INECN) MINATE (INECN)	Y insufficient Y insufficient	N N
A15.1. Review Oil and Mines Act in order to take into account environmental impacts A15.2. Negotiate agreements with other riparian countries	Possible now Possible now	MEM MEM	Y Y	Y N

Sedimentation				
B1.1. Evaluate impact of problem and identify more accurately erosion areas generating higher risks over lake biodiversity	Ac. to resources	MINATE	Y	N
B1.2. Plan catchment (agro-forestry, anti-erosive practices), raise awareness and promote participative approach	On going, extension ac. to resources	MINATE	N	N
B1.3. Research – development and extension of suitable techniques	On going, extension ac. to resources	MAE	Y	Y <small>insufficient</small>
B1.4. Planning focused on sediment deposits in the valleys, traps for sediments	Ac. to resources	MINATE	N	N
B1.5. Define special standards and prioritise interventions to areas identified under B1.1	>B1.1	MINATE	Y	N
B2.1. Strengthen legal basis for Protected Areas	Possible now	MINATE (INECN)	Y	Y
B2.2. Expansion of network of Protected Areas to cover all natural forests	O	MINATE (INECN)	N	N

B2.2. Update Forestry and Land Act (notably by making regulations for trade of forest products), harmonise with Environment Act	On going	MINATE ISABU, MINATE	Y	N
B2.3. Compensate people expelled from PAs when they are set up	Ac. to resources	Government	N	N
B2.4. Demarcate and materialise PAs boundaries	>B2.1	MINATE (INECN)	N	N
B2.5. Demarcate and materialise national forests boundaries	>B2.2	MINATE (Forestry Dep)	N	N
B2.6. Inventory of forests and evaluate damage	Ac. to resources	MINATE (Forestry Dep)	N	N
B2.7. Rehabilitation of destroyed parts of PAs	Ac. to resources	MINATE (INECN)	N	N
B2.8. Rehabilitation of destroyed woods	Ac. to resources	MINATE (Forestry Dep)	N	N
B2.9. Environmental education (at all levels)	On going, extension ac. to resources	MINATE (INECN)	Y insufficient	Y insufficient
B2.10. Prepare PAs management plans with participative approach (community management) and identify alternative resources	Ac. to resources	MINATE (INECN)	N	N
B2.11. Prepare participative management	Ac. to resources	MINATE (Forestry Dep)	N	Y insufficient

plans for woods B2.12. Promote agroforestry and private woods	On going, extension ac. to resources	MINATE (Forestry Dep)	Y insufficient	Y insufficient
B2.13. Reinforce supervision of PAs and INECN capacities	On going, extension ac. to resources	MINATE (INECN)	Y insufficient	Y insufficient
B2.14. Reinforce supervision of woods	Ac. to resources	MINATE (Forestry Dep)	Y insufficient	N
B3.1. Raise awareness of population	On going, extension ac. to resources	MINATE (INECN)	Y	Y insufficient
B3.2. Set up preventive measures for intervention	On going, extension ac. to resources	MINATE	Y	N
B3.3. Check enforcement of law	On going, extension ac. to resources	MINATE	Y insufficient	Y insufficient
B3.4. Studies geared to respond to uncertainties	Ac. to resources	MINATE (INECN)	N	Y

B4.1. Review Act n° 1/40 of 18 December 1991 (provision for taking into account of EI and site restoration)	On going	MEM	Y	Y
B4.2. Intersectoral consultation according to law prescription	Possible now	MEM	Y	Y
B4.3. Designate alternative working sites	Ac. to resources >B4.7	MEM	Y	N
B4.4. Raise awareness	>B4.3	MEM	Y	Y insufficient
B4.5. Expand powers for DMC to supervise small workers	Possible now	MEM	Y	Y
B.4.6. Plan sanitation network of Bujumbura	Ac. to resources	Mayor (SETEMU)	Y insufficient	N
B4.7. Inventory of quarries and exploitable deposits	Ac. to resources	MEM	Y insufficient	N
B4.8. Control and monitor land reclamation	Ac. to resources	MINATE	Y insufficient	N
B5.1. EIA and monitor new road projects	Ac. to projects	MINATE	Y insufficient	Y insufficient
B5.2. Prepare environmental guidelines for minor projects non subjected to EIA (rural trails) ; extension of these guidelines	Possible now	MINATE	Y	Y
B5.3. Mobilise and raise awareness of population to maintain rural trails and paths	On going	MDC	Y	Y
B5.4. Make-up existing road banks (stabilise slopes, plan hydrous discharge, control torrents)	Ac. to resources	MTPE	Y	N

B6.1. Raise awareness of DMC and territorial administrations	Possible now	MEM	Y	Y
B6.2. Organise gold washers into associations	Possible now	MEM	Y Y	Y Y
B6.3. Strengthen capacities for DMC to control and supervise	Ac. to resources	MEM		
B6.4. Translate in Kirundi and disseminate technical standards for work and land reclamation	Ac. to resources	MEM	Y	Y
B7.1. Clarification about land use	On going	MINATE	Y	Y
B7.2. Promote permanent stalling and breeding of improved species	Ac. to resources	MAE	N	N
B7.3. Raise awareness of cattle farmers	On going	MAE	Y	Y
B8 : see A12				
B9.1. Try forestry species that protect land	Ac. to resources	ISABU	Y insufficient	N
B9.2. Multiplication of those suitable species	>B9.3	MINATE	N	N
B9.3. evaluate impact, erosion actions	>B9.2	ISABU	Y insufficient	N

<p>B10.1. Review urban centres classification and recognition of new towns</p> <p>B10.2. Urban centres planning scheme (anticipate land use plans, and retention measures of land and sediment)</p> <p>B10.3. Promote techniques for rain water control in rural areas</p> <p>See also B2 and B4</p>	<p>Ac. to resources</p> <p>Ac. to resources</p> <p>Ac. to resources</p>	<p>MTPE</p> <p>MTPE</p> <p>MDC</p>	<p>Y</p> <p>Y insufficient</p>	<p>N</p> <p>N</p>
Fishing				
<p>C1.1. Strengthen capacities for Fisheries</p> <p>Dep. to control and supervise</p>	<p>Ac. to resources</p>	<p>MAE (Dep. of Fisheries)</p>	<p>N</p>	<p>N</p>
<p>C1.2. Raise awareness and train (fishermen, boat owners, administration)</p>	<p>Idem</p>	<p>MAE (Dep. of Fisheries)</p>	<p>Y insufficient</p>	<p>N</p>
<p>C1.3. Ascertain potential, fishing standards and acceptable licensing quotas</p>	<p>On going, extension ac. to resources</p>	<p>MAE (Dep. of Fisheries)</p>	<p>Y insufficient</p>	<p>Y insufficient</p>
<p>C1.4. Resort to the Environment Fund and maintain the fund by tax raising on fish</p>	<p>As from Fund setting up</p>	<p>MINATE</p>	<p>Y</p>	<p>Y</p>
<p>C1.5. Support other income generating activities or those that supply animal proteins</p>	<p>On going, extension ac. to resources</p>	<p>MDC</p>	<p>Y insufficient</p>	<p>Y insufficient</p>

C1.6. Update and issue draft law and by-laws, as well as ordinances	Possible now	MAE (Dep. of Fisheries)	N	N
C1.7. Translation in Kirundi and extension	>C1.6	Government MAE	Y	Y
C2.1. Evaluate scale of problem	Ac. to resources	MAE (Dep. of Fisheries)	N	N
C2.2. Review and issue draft Act and adopt by –laws (with introduction of more realistic mesh size, around 20mm)	Possible now	Government	Y	Y
C2.3. Translate Act in Kirundi and extension	>C2.3	MAE (Dep. of Fisheries)	Y	N
C2.4. Monitor and supervise	>C2.3	MAE (Dep. of Fisheries)	Y	N
C2.5. Raise awareness and train	Ac. to resources	MAE (Dep. of Fisheries)	Y	N
C2.6. Encourage fishermen to group into associations (incl. small fishermen)	Ac. to resources	MAE (Dep. of Fisheries)	Y	N
C3.1. Inventory of more sensitive spawning areas	On going, extension ac. to resources	MAE (Dep. of Fisheries)	Y	Y insufficient
C3.2. Review draft law, promulgation, translation, extension	Possible now	MAE (Dep. of Fisheries) Government	Y	Y
C3.3. Strengthen control and watching sensitive spawning areas (Murembwe, Nyengwe, Rwaba and others to be identified)	Ac. to resources	MAE (Dep. of Fisheries)	Y	N
C3.4. Raise awareness (at all levels)	Ac. to resources	MAE (Dep. of Fisheries)	Y	N

C4.1. Prepare list of threatened species and proposal of inclusion in CITES lists	Possible now	MINATE (INECN)	Y	Y
C4.2. Regulations, control, monitoring	Ac. to resources	MINATE (INECN)	Y	N
C4.3. Encourage fish farming of those species	Ac. to resources	MAE (Dep. of Fisheries)	Y	
C4.4. Raise awareness	Possible now	MINATE (INECN)	Y	N
C4.5. Set up protected areas (demarcation, watching, eco - tourism development, prepare management plans)	Ac. to resources	MINATE (INECN)	Y	N
C5.1. Inventory of fish farming sites, evaluation of risk	Ac. to resources	MAE	Y	N
C5.2. Follow up of population of introduced species (Ruzizi cichlide) and evaluate risk	Ac. to resources	MAE	Y	N
C5.3. Control entrance of species in the country	Possible now	MAE	Y Y	N Y
C5.4. Regulations	Possible now	MAE		
C6.1. Feasibility study for collecting those plants and their use in organic fertilisation (exchange of experience)	Ac. to resources	MINATE (INECN)	Y	N
C6.2. Apply results, by priority in the areas of the passing through of boats	>C6.1	MINATE (INECN)	Y	N
C6.3. Raise awareness of boat operators	Possible now	MINATE (INECN)	Y	N
C6.4. Watching floating plants	Ac. to resources	MINATE (INECN)	Y	N

C7.1. Introduce fishing periods	>C6.1	MAE (Dep. of Fisheries)	Y	Y
C7.2. Control	>C7.2	MAE (Dep. of Fisheries)	Y insufficient	Y insufficient
C7.3. Raise awareness	<C7.2	MAE (Dep. of Fisheries)	Y insufficient	Y insufficient
Protection of supra littoral area				
D1.1. Mapping supra littoral area and cultivated area	Ac. to resources	MINATE	Y	N
D1.2. Raise awareness	Ac. to resources	MINATE (INECN)	Y	N
D1.3. Participative management and non destructive recovering of natural resources	Ac. to resources	MINATE (INECN)	Y	N
D1.4. Isolate sensible areas as protected areas (Murembwe, Nyengwe, Rwaba)	Ac. to resources	MINATE (INECN)	Y	N
D2.1. Control sand extraction	Ac. to resources	MEM	Y	N
D2.2. Raise awareness	Ac. to resources	MAE (INECN)	Y	N
D2.3. Control reed exploitation	Ac. to resources	MINATE (INECN)	Y	N
D2.4. Banning	Possible now	MINATE (INECN)	Y	Y
D2.5. Land use plans	Ac. to resources	MINATE -MTPE	Y	N

ANNEX 2 Justification of the first priorities : Pollution

Specific problem	Seriousness for lake biodiversity	Feasibility of solutions	Additional reasons
1. Pollution of Bujumbura	Main cause of pollution	Existence of solutions Progress recent or on going Interventions localised	Quality of drinking water and washing water Fisheries; Possible recovering of waste
2. Overflows through Bujumbura	Important cause of lake pollution	Existence of solutions identified, but interventions less localised	Protection of town (people, infrastructures, goods) Quality of lake waters and fisheries
3. Pollution by lake transport	Fairly important cause of pollution: chronic pollution and risk of serious accidental pollution	Existence of known solutions Potential sources of pollution limited, identifiable	Quality of lake waters and fisheries Security of navigation
4. Pesticides and agricultural fertilisers	Secondary cause of pollution: problem of pesticides decreasing, problem of fertilisers moderate	Existence of solutions	Quality of lake waters and fisheries; Quality of agricultural production Health of farmers; Possible savings of inputs
5. Water hyacinth	Danger known by other lakes	Existence of preventive solutions; Difficulties for	Fisheries

		curative solutions	
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Justification of the first priorities : Sedimentation

Specific problem	Seriousness for lake biodiversity	Feasibility of solutions	Additional reasons
1. Unsuitable farming practices	Major cause of erosion	Existence of technical solutions or alternates, but problem of great scale and need of sustained effort	Fertility of soil, sustainable agricultural development, food security
2. Inappropriate instruments	Major cause of erosion	Existence of technical solutions or alternates, need of sustained effort	Forestry products (timber and other), forestry biodiversity, hydrological roles of forest
3. Disrupting of rivers and quarries	Direct and important cause of sedimentation	Existence of technical solutions; Problem localised	Alleviation of overflow damage
4. Traffic ways	Serious local impact	Existence of solutions or alternates; problem localised, easy to master	Economic development
5. Fires	Secondary cause, of not well identified importance	Existence of technical solutions; Difficult to raise awareness	Maintenance of soil fertility and of land ecosystems; protection of goods and plantations

Justification of the first priorities : Fishing

Specific problem	Seriousness for biodiversity	Feasibility of solutions	Additional reasons
1. Excessive fishing practices	Big pressure on biodiversity concentration zones	Existence of solutions	Better fishing production
2. Land clearings	Big pressure on biodiversity concentration zones; Destructive gear, not very selective	Existence of solutions or alternates, but more difficult	Better fishing production
3. Fishing in spawning areas	Big pressure on biodiversity concentration zones	Existence of solutions ; Localised interventions	Better fishing production
4. Trade of ornamental fish	Impact on rocky areas, rare and rich in biodiversity; Vulnerability of targeted species	Specialised exporters, not numerous, identifiable	Possible recovering by eco- tourism
5. Introduction of species	Risk potentially serious	Existence of preventive solutions, but non curative	Maintenance of ecological balance, on which depend fishery

Annex 3 List of Burundian NWG members and participants or invitees to workshops

Name	Organisation (Duties)	Name	Organisation (Duties)
MANIRAKIZA Jean Berchmans	LTBP (NC), INECN (DG)	NIRAGIRA Gaspard	MINATE (Adviser)
KINEZERO Mathias	MINATE (Head of Cabinet)	KABWA Agapit	MINATE (Adviser)
KANYARU Roger	DoF, Fish farming, Water (Director)	GAKIMA Cécile	INECN (Director)
SONGORE Tharcisse	Geology and Mining	NTIRANYIBAGIRA Elysée	INECN (Technical Director)
BAKEVYA Pierre	Urban Planning (Director)	NINDORERA Damien	INECN (Adviser)
NDIZEYE Pascal	Lake transport dep. (Director)	NZIGIDAMERA Benoit	INECN (Adviser)
RUZIMA Salvator	Communal Development (DG)	NTUNGUMBURANYE Gérard	IGEBU
BARANDEMAJE Denis	Hydraulic Resources (Director)	BANDANAZA Ignace	ETP Gitega
NTAKIMAZI Gaspard	University of Burundi (Professor)	WEST Kelly	LTBP (Technical Liaison Officer)
NIMPAGARITSE Didace	University of Burundi (Professor)	Célestin	SETEMU (Programme Officer)
NKURUNZIZA François	University of Burundi (Professor)	Marcellin	PNUD
NSABIMANA Stanislas	University of Burundi (Professor)	HANEK George	PLT, FINIDA
KINYOMVYI Antoine	ODEB	Ignace	ONAPHA (Technical Director)
HAKIZIMANA Gabriel	INECN (Expert)	LEDANT Jean Paul	NRI, LTBP (SAP Facilitator)
BUKURU Jean Marie	Rural Engineering Dep. (Director)	DRIEU Olivier	NRI, LTBP (Sed. Facilitator)