Water Governance Benchmarking Criteria

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A. GOVERNANCE FUNCTIONS

1. Organizing and building capacity in the water sector
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- 1.3 Setting national water policy
- 1.4 Establishing linkages among sub-sectors, levels, and national sub-regions
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- 1.8 Developing and utilizing well-trained water sector professionals

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- 2.3 Designing strategies for matching expected long-term water supply an demand and dealing with shortfalls (including drought mitigation strategies)
- 2.4 Developing planning and management tools to support decision making

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- 3.1 Awarding and recording water rights and corollary responsibilities
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- 3.3 Adjudicating disputes
- 3.4 Assessing and managing third party impacts of water and water rights transactions

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- 4.3 Operating and maintaining public infrastructure according to established plans and strategic priorities
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   - 2.4 Environmental
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   - 2.6 Fisheries, navigation, recreation
   - 2.7 Other uses (including social, esthetic, and religious uses)

River Nile Protection and Development Project

Phase II

Central Laboratory for

Environmental Quality Monitoring

Report N°A3010901 – 9508 – 01 - FR

Environmental Pollution and Legislative Regulations (Law 48. 1982 & Decree 8, 1993) August 1995

Egyptian Executing Agency
National Water Research Center
Ministry of Public Works and Water Resources

Funding Agency
Canadian International Development Agency
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SNC – Lavalin Inc.

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ENVIRONMENTAL POLLUTION AND LEGISLATIVE REGULATIONS (Law 48- 1982 & Decree 8-1983)

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1.0 INTRODUCTION AND REVIEW OF INSTITUTIONAL AND LEGISLATIVE REGULATIONS

The River Nile, the main source of life for Egypt, is becoming increasingly more polluted. Uncontrolled populations increases and the spiralling problems of pollution from effluent waste materials are the main reasons for this serious environmental problem. This situation is not limited to inland waters since the Nile water carries its load of pollutants to the near shore areas.

Protection of the River Nile against pollution is one of the main responsibilities of the Ministry of Public Works and Water Resources (MPWWR). Its National Water Research Center (NWRC) is one of the leading governmental agencies to confront the serious issue of water quality, lending a multi-disciplinary insight into the environmental problems, as well as into the diagnostics and analytical measures required to solve them.

1.1 Environmental Pollution

The natural balance of aquatic systems is particularly affected by two groups of substances:

a) Nutrients, which cause an unrestricted biological growth and consequently cause oxygen depletion.

b) Synthetic chemicals which often constitute adverse effects on the aquatic ecosystem.

Some of these substances have direct and indirect effects on humans and may cause serious damage (polycyclic aromatics, pesticides, radioactive materials, and trace metals).

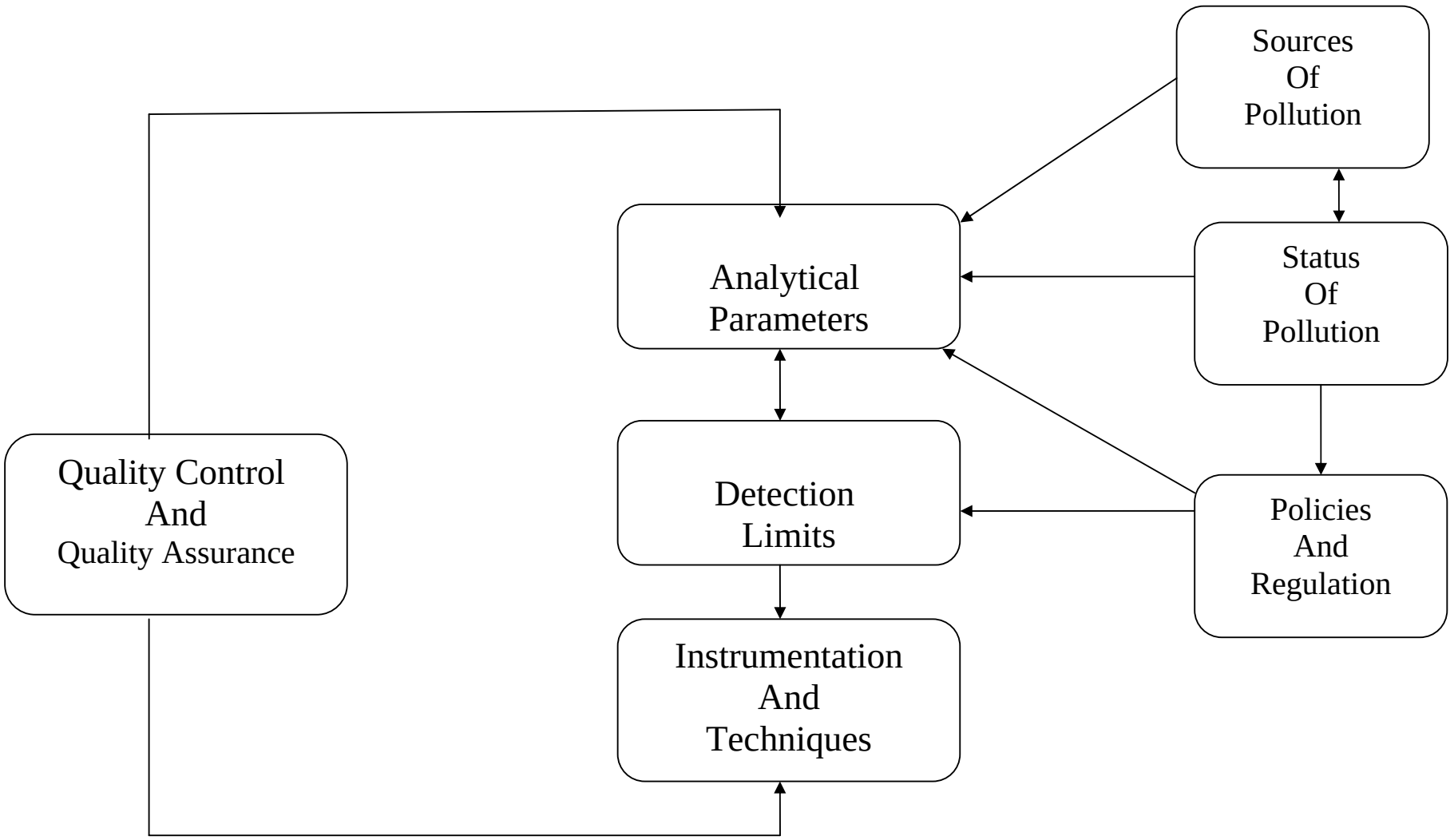
Water pollution has been identified as a major environmental problem over the past decades. The range of water pollutants is known to be very broad and may include petroleum constituents, heavy metals, dioxins, pesticides, organic solvents, and other substances of potential environmental and public health concern. A great number of reports documenting various survey levels have indicated important differences at the level of water pollution in groundwater and surface water. However, most reports failed short of accurately defining the water pollution status. For this reason, there is a crucial and immediate need for determining the status of water pollution, its sources and constituents in order to establish policies and regulations. Uncertainty and inconsistency with respect to how seriously water is polluted creates confusion and affects regulatory approaches.

1.2 CLEQM Function and Approach

For CLEQM to serve parameters, detection techniques, frequency, its purpose and objectives, issues like analytical limits, equipment, analytical methods, sampling and others need to be addressed, and established.

Within this framework the first step taken by CLEQM was to review the environmental regulations, specially Law 48-1982 and Decree 8-1983, in order to develop a consensus guidelines on:

1. Analytical Parameters.
2. Analytical Techniques.
3. Laboratory Equipment and Instrumentation.
4. Quality Control and Assurance.



CLEQM Approach to Produce Precise Analytical Results and to Meet Objectives

1.3 Pollution Sources

World wide, the efforts of removing industrial pollutants from the environment have not been able to keep pace with the increasing amount of generated waste materials, which in some cases resulted in the transformation of lakes and rivers into sewage depots.

In Egypt, great support was given to industrial development during the 1 950's, while inadequate attention was paid to the long-term effect on the environment. Regulations and standards were not enforced, and untreated waste waters have been discharged ever since into the Nile, Lakes, Canals, and the Mediterranean sea. It is reported that waste water from 350 industries are discharged directly into the Nile or through municipal systems which also discharge into the Nile. Pollution is increasing due to the discharge of untreated industrial and domestic waste water, contaminated agricultural drainage water, and petroleum products from navigation.

1.4 Legislative Regulations

Waste water disposal in sewage systems was legislated by Law "93" with Ministerial decrees "649" in 1962 and "9" in 1989. Clearance of weeds and dead animals disposal in streams were regulated by Law "74" in 1971. Protection of the River Nile and Waterways from pollution was created by Law "48' in 1982 and Ministerial decree "8"in 1983 (MPWWR). Protection of the environment against industrial pollution was initiated by Ministerial decree "380" in 1982. The present water law is made of two recent acts: Law 48 (1982) and Law 12 (1984).

The Rive Nile Control Law (Law 48, 1982) regulates the discharge of effluent into the Nile and associated waterways, in view of their protection from pollution. It generally:

- Imposes licensing by the Ministry of Public Works and Water Resources, (MPWWR) of the discharge of all solids, liquids and gaseous effluents;
- Specifies quality standards of effluent;
- Prohibits the use of drainage water unless the suitability is ensured;
- Entrusts the Ministry of Interior (Police) with control of waterways;
- Provides authority to the irrigation engineers of MPWWR to inspect all types of establishments licensed to discharge effluents to waterways;

- Entrusts the Ministry of Health (MOH) with the collection of samples and laboratory analysis;
- Creates a fund to receive fees and fines, to be used for laboratory analysis and studies, subsidizing water treatment, and rewarding informants on law violation; and
- Define penalties..

Decrees issued by MPWWR further specify fields of application, regulations and standards.

The Irrigation and Drainage Law (Law 1 2, 1 984) regulates the use of water including groundwater, and provides equity to the users. The Law controls the operation of the field laterals (mesqa'a) and field drains, water lifting devices and shore protection.

Law 1 2, 1 984 generally regulates the followings:

- Water rights and water ownerships.
- Areal and sector water use priorities.
- Beneficial and harmful use of water.
- Groundwater use and administration at national, regional and local levels.
- Financial and economic aspects of water resources, including state participation; water rates and charges; and reimbursement policies (especially with respect to field drainage).
- Penalties.

An integrated environmental law presented by the Egyptian Environmental Affairs Agency (EEAA) was approved by the National Assembly in 1 993. The standards and specifications for law enforcement has not been made public yet.

2.0 REVIEW OF REGULATIONS AND STANDARDS

Egyptian authorities have issued Law 48 (1 982) in order to protect the River Nile and waterways from pollution. According to the Law, MPWWR (Ministry of Irrigation, at the time it was issued) is responsible for protecting the quality of Nile water. In this context, the MPWWR issued Decree No. 9-1983 to be the implementary regulations for Law 48-1 982.

2.1 LAW48 -1982

Regarding the protection of the River Nile and Waterways from pollution.

2.1.1 Defining waterways

According to Law 48, the Following Are Considered to Be Waterways:

A- Fresh surface water bodies including:

1. The River Nile
2. The Main Canals (Rayahat), Canals of all types, and ditches (Ganabyat).

B- Brackish - surface water bodies including:

1. Drains of all types
2. Lakes
3. Ponds, enclosed surface water bodies

C- Ground water reservoirs

2.1.2 Setting Policies

The Law prohibits:

1. Discharging of solid or liquid or gaseous waste from various sources and establishments, or from sanitary drainage and other operations into the waterways, unless a license is acquired from the MPWWR under the conditions specified by the Ministerial decree (Decree 8- 1 983). Standards set in the decree are based on those proposed by the Ministry of Health. The Ministry of Health will also carry the periodic sample analyses of charged treated liquid effluent. 2, 11

2. The construction of establishments producing wastes to be discharged into waterways. The MPWWR is the only organization authorized to permit the construction, if it is in the public interest. [1, 9]

3. The Owners of floating vessels from discharging wastes into the Nile. [3]

4. The uses of various types of pesticides and herbicides. [5]

2.2 Decree No. 8-1983

The Implementary Regulations for Law 48-1982 Regarding the Protection of the River Nile and Waterways

The decree was built on reviewing Law 93 (1 962) concerning the discharge of liquids and wastes, Law 38 (1967) concerning public hygiene, Law 74 (1971) concerning irrigation and drainage, and Law 48 (1982) concerning the protection of the River Nile and waterways from pollution.

The decree defines all terms mentioned and regulated in Law 48-1 982, and gives a full description for each subject.

The decree also sets the rules for issuing permits to discharge treated liquid effluent.

2.2.1 Regulations [4]

1. The use of sides or banks of water bodies for discarding solid is strictly prohibited.
2. It is not allowed to dump, store or throw chemical or toxic substances on the sides or on the banks of waterways. [6]
3. The industrial liquid effluent whose discharge into waterways is licensed should not include any chemical pesticides, radio active substance, substance which would be suspended in waterways or any substance harmful to human beings, animals , plants, fish or birds,and it is strictly prohibited and should not be included in any licensed effluents discharging to waterways. [7]
4. It is prohibited to discharge any raw industrial liquid effluent or industrial cooling water into fresh water bodies or ground water reservoirs. [8]

It is clearly understood from Decree No. 8-1 983, that ***only the treated effluents are allowed permeation to discharge to waterways.*** The standards and specifications for issuing the licence are clearly set along with the legistics of application's. The decree authorized the Ministry of Health to carry out sampling, analytical checking and general monitoring activities for licensed establishments. [12]

The Decree also states that the representatives of the MPWWR, MOH, and Concerned Sanitary Drainage Agency have full rights to enter all permitted establishments at any time for periodic and non-periodic sampling and inspection of facilities. [10]

2.2.2 Guidelines for sampling and analysis

For sampling and analysis, the following items are specified by the Decree:

Sample size	Not less than 2 liters.
Bottles	Sealed frosted glass-covers
Container	properly cleaned, and must be sterilized when sampling chlorine-treated liquid effluents.
Analysis	MOH Labourites
Time	Immediately (within 3 hrs) or, must be stored in a cooling box with the bottles covered with ice. "when sample arrives to the laboratory remnants of ice must be persisting."
Sampling	Representable of actual saturation and bottles must be completely filed with no gases.

2.2.3 Standards and specifications

Tables 1,2,3,4& 5 include codes, standards and specifications of the discharge of treated liquid effluent (TLE) into waterways identified by the decree in order to implement Law 48. [13]

Table 1. S tandards an d specif ications of all owable discharged treat ed industrial liquid effluent (TILE) to fresh water.

Parameter	Standards & Specifications (mg / I)
Color	Not to exceed 100 degree
Total Solids	500
Temperature	5 °C above normal
Dissolved Oxygen	Not Less than 5
pH	Within the range 7 - 8.5
Biochemical Oxygen Demand	Not to exceed 6
Chemical Oxygen Demand	Not to exceed 10
Organic Nitrogen	Not to exceed 1
Ammonia	Not to exceed 0.5
Oils and Grease	Not to exceed 0.1
Total Alkalinity	Within the range 20 - 1 50
Sulphate	Not to exceed 200
Mercury compounds	Not to exceed 0.001
Iron	Not to exceed 1
Manganese	Not to exceed 0.5
Copper	Not to exceed 1
Zinc	Not to exceed 1
Synthetic Detergents	Not to exceed 0.5
Nitrate	Not to exceed 45
Fluorides	Not to exceed 0.5
Phenol	Not to exceed 0.02
Arsenic	Not to exceed 0.05
Cadmium	Not to exceed 0.0**1**

Table 1. S tandards an d specif ications of all owable discharged treat ed industrial liquid effluent (TILE) to fresh water. (cont).

Chromium	Not to exceed 0.05
Cyanide	Not to exceed 0.1
Lead:	Not to exceed 0.05
Selenium	Not to exceed 0.01

The MPWWR can allow discharges to exceed some of the limits set in table 1, In some cases where the volume of treated industrial liquid effluent discharged to fresh surface water bodies is not greater than 100 m^3 /day.

Table 2. Allowable discharge limits for TILE not greater than 100 m^3 /day

Parameter	**Maximum limits of TILE discharged in**	
	River Nile from Southern borders up to Delta Barrage	**Branches, Rayah, canals, and groundwater reservoirs**
Biochemical Oxygen Demand	40	30
Chemical Oxygen Demand (Dichromat)	60	40
Chemical Oxygen Demand (Permanganate)	20	15
Total Solids	1500	1000
Fixed Ash of Solids	1000	900
Suspended Solids	40	30
Oil + Grease + resine	10	10
Nitrate	40	30
Phenol	0.005	0.002

Table 3. Standards and specifications of sewage and industrial liquid effluent which are licensed to discharge into brackish or saline surface water bodies.

Parameter	Maximum limit (mg / I)	
	Sewage Effluent	Industrial Liquid Effluent
Temperature	35° C	35° C
pH	6-9	6-9
Biochemical Oxygen Demand	60	60
Chemical Oxygen Demand (Dichromat)	80	100
Chemical Oxygen Demand (Permanganate)	40	50
Dissolved Oxygen	Not less than 4	……
Oil and Grease	10	10
Dissolved. Solids	2000	2000
Suspended Solids	50	60
Coloured Substances	Free of col. sub.	Free of col. sub.
Sulphide	1	1
Cyanide	….	….
Phosphate	….	0.1
Nitrate	5	40
Fluorides	….	0.5
Phenol	….	0.005
Total heavy metals	1	1
All pesticides	nil	nil
Total Coliform (MPN/100 ml)	5000	5000

When sewage effluents or industrial effluents mixed with sewage effluents are discharged into non-fresh surface water bodies, the effluents must be treated with chlorine for disinfection prior to discharge according to the request of the relevant authority, such that the residual chlorine will not be less than 0.5 mg / L per minutes after its addition.

Table 4. Stan dards and specifications of brackish or salin e surface bodies into which discharge of treated liquid effluent

Parameter	Standards and Specifications (mg/I unless otherwise noted)
Temperature	Not to exceed 50 C above normal average
Dissolved Oxygen	Not less than 4 mg/I at any time
pH	Within the range 7 - 8.5
Synthetic Detergents	Not to exceed 0.5 mg/I
Phenol	Not to exceed 0.005 mg/I
Turbidity	Not to exceed 50 mg/I
Total Dissolved Solids	Not to exceed 650 mg/I
Total Coliform (MPN / 100 ml)	Not to exceed 5000 mg/I

Table 5. Required drainage standards before lifting to/or mixing with fresh surface water bodies

Parameters	Standards (mg/liter unless otherwise noted)
Colour	Not to exceed 100 units
Total Solids	500
Temperature	50 °C above normal average
Odour	2 Degree
Dissolved Oxygen	Not less than 5
pH	Within range : 7 -- 8.5
Biochemical Oxygen Demand	Not to exceed 10
Chemical Oxygen Demand (Dichromat)	Not to exceed 1 5
Chemical Oxygen Demand (Permanganate)	Not to exceed 6
Ammonia	Not to exceed 0.5
Oil and Grease	Not to exceed 1
Total Alkalinity	Within range 50 -- 200
Mercury compounds	Not to exceed 0.001
Iron	Not to exceed 1
Manganese	Not to exceed 1 .5
Copper	Not to exceed 1 .0
Zinc	Not to exceed 1 .0
Synthetic Detergents	Not to exceed 0.5
Nitrate	Not to exceed 45
Fluorides	Not to exceed 0.5

Table 5. Required drainage water standards before lifting to/or mixing with fresh surface water bodies (cont).

Phenol	Not to exceed 0.02
Arsenic	Not to exceed 0.01
Cadmium	Not to exceed 0.01
Chromium (Hexavelant)	Not to exceed 0.01
Cyanide	Not to exceed 0.1
Tannin + Lignin	Not to exceed 0.5
Phosphate	Not to exceed 1 .0
Carbon derivatives (Chloroform)	Not to exceed 1 .5 gm / I
Total Coliform (MPN / 100 ml)	Not to exceed 5000

3.0 REMARKS ON LAW 48

Law 48 regarding the protection of the Nile and related waterways from pollution, was accepted and implemented in 1 982. Enforcement of the law is not yet materialized, most likely because It did not include a realistic phasing for reduction of the discharges to meet the standards. To enable enforcement for the future, temporary permits with a realistic phasing in reductions and penalties for discharged amounts of pollutants should be considered.

The standards specified in the Law 48) 982 1-Table 1 through 5) include

a) The water quality of fresh water bodies, which receive treated industrial liquid effluent (TILE).
b) The quality of TILE discharged to fresh water bodies and ground water reservoirs, with different standards for the Nile, its branches, canals and groundwater;
c) The quality of TILE discharged to fresh water bodies and ground water reservoirs, with a discharge not greater than 1 00 m I day;
d) The required quality of drainage water allowed for mixing with fresh water bodies;
e) The quality of sewage and industrial effluents which discharge on brackish or saline water bodies (including the drains) and
f) The water quality of brackish or saline surface water bodies (including the drains) which receive treated effluents.

Tables 1 through 5 indicate that, the standards put for effluents are not consistent with those for the receiving water bodies. Inconsistency between the standards for the fresh and saline (brackish) water may also be noticed:

a) No standards were given for effluents containing some toxic metal, such as (Al and Ni) .
b) The standard for nitrate can be insufficient when no biological treatment is applied. In that case, the oxidized form of nitrogen might be low, in which, the Total Nitrogen (Organic + Ammonia + Nitrate) might be high. This may require some reconsideration, because the standards for receiving fresh water bodies include organic, and ammonium as well as nitrate.

c) Standard for sewage effluents were only given for discharges in brackish and saline water bodies.

d) For the reuse of drainage water the allowed “COD” values of 1 5 mg/I for dichromat and 6 mg/I for permanganate, are low when compared to the “BOD allowed value of 10 mg/I.

e) Additionally, Egyptian standards for copper and zinc (1,000 pg/I) in receiving water bodies are considered too high when compared to the European standards of 5Opg/l for copper* and 150 pg/I for zinc.*

f) The standards for both the receiving fresh and saline (brackish) water bodies were not related to various functions such water bodies have to fulfil. Water use can differ significantly from drinking water supply, swimming water, fisheries, to irrigation water.

   Standards should be tuned to such functions, because some waterways may require less rigid standards, while specific parameters and more strict standards should be added and enforced for others.

g) With the exception of the standards for effluents on brackish and saline water bodies, no standards were given for pesticides.

h) No standards were specified for the pollution of sediments. Because of the sedimentation downstream of lakes and lagoons, it can be expected that in such regions, toxic substances like heavy metals and organic micropollutants may accumulate at the bottom sediments by precipitation or adsorption. Since benthic organisms will be exposed to pollutants in the sediments, this might result in accumulation of pollutants in the food chain, including fish as well as birds, and ultimately human beings. Polluted sediments can also reduce the possibilities for future land use in case of these sediments are used for land reclamation.

Adjustments of maximum limits should be made for the concentration of specified pollutants in water according to the intended use of each water body.

Major Organic parameters were not also specified in Low 48 inspite of their high toxicity and great influence on water quality.

Addition of the following organic parameters is extremely important for the preservation of water quality and human health:

1. **Surfactants:** These substances enter water and wastewatérs mainly by discharge of aqueous wastes from household and industrial laundering and other cleaning operations. They impart undesired properties such as foaming, emulsification and particle suspension.

2. **Dioxin:** Examples of these compounds are polychlorinated dibenzodioxin (PCDD) and polychlorinated dibenzofuran (PCDF) which belong to the dioxin group and occur as undesired by products in the manufacture of chlorophenols, chlorinated biphenyls ,chlorobenzenes, maphthalens and biocide. Besides their production in incineration processes, emissions from car exhausts, paper pulp and sludge, etc.

   Due to their environmental stability, good solubility in fats. and slow metabolism, they are often observed in biological tissues, human fats and milk.

3. **Polycyclic Arom atic Hyd rocarbons (PAHs):** These compounds enter the environment from the incomplete combustion of organic hydrocarbons. The sources also include tarcigarette smoke, industrial incinerators and car exhaust. PAHs are found in various environmental matrices such as water and soil. Several of PAHs are suspected of being carcinogenic or mutagenic, for example benzo (a) pyrene is strongly carcinogenic. It is therefore very important not only to analyze these substances globally, but also as individual components.

4. **Highly Volatile Halogenated Hydrocarbons:** Examples of these compounds are dichloromethan, 1, 1, 1 -trichloroethan, chloroform, carbon tetrachloride, trichloroethylene and tetrachloroethane. They are usually formed as intermediate products during the manufacture of fluoro hydrocarbons and are used as solvents. Chloroform particularly results from the chlorination of drinking water. Halogenated hydrocarbons are generally toxic and some of them have carcinogenic and mutagenic properties.

5. **Polychlorophenols:** Chlorinated phenols are wide-spread as insecticides and disinfectants. The intensive use of polychlorophenols may coause problems due to their toxic properties.

6. PolychlorinatedBipheny/s (PCBs): These substances are used as cooling or insulating fluids for transformers, as softeners in varnish and adhesive industries and as hydraulic fluids. There is a severe toxic effects of PCBs which damage the organs responsible for metabolism and also the nervous system PCBs are not combustible and because of their persistence, they are widely spread in the environment and due to their lipo-solubility are easily deposited and concentrated in human, animal and plant tissues.

The limits of microbiological parameters set by the Law for the discharged effluent to the River Nile, branches, canals, ditches, groundwater, drainage water and brackish or saline surface water are indicated below:

Parameter	**River Nile**	**Nile branches, main canals, branch, ditches and groundwater reservoirs**	**Drain Water**	**Brackish or saline surface water**
Total Coliform MPN/100 ml	2500	2500	5000	5000

The use of total coliform as an indicator of water pollution may constitute a deficiency as recorded by several investigators where pathogenic bacteria and viruses were detected in free coliform samples. Thus, the use of Faecal streptococci as an additional indicator to coliform group may overcome the deficiency in this group.

A wide variety of pathogenic microorganisms can be transmitted to humans through use of natural fresh and marine recreational waters that may be contaminated by wastewater. These include enteropathogenic agents, such as salmonella, shigella, enteroviruses, protozoa and multicellular parasites which may multiply in recreational water in the presence of sufficient naturally occurring recreational waters with the faecal coliform test. Faecal streptococci may be the best indicator for marine waters while E.coli may be best for fresh water .An application of the faecal streptococci test is in the development of faecal coliform: faucal streptococci ratio American Public Health Association (APHA, 1992). Accordingly, faecal streptococci should be added as an indicator of faecal pollution, to the limits recorded in the Law beside faecal coliform density (70/1 00 ml in the fishing areas of the lakes and should not exceed 230/1 00 ml in 10% of samples) .

k. The Law does not include regulations regarding soil pollution. Soil pollution should be included in future decrees to prevent the degradation process caused by diffusive pollution through water.

The sodium ion is a major soil pollutant because of its damaging effect on soil structure. This problem is caused by the dispersion and swelling actions of clay particles. Soil pore spacing will be reduced and consequently total porosity, soil moisture content at any suction value (field capacity, wilting point and saturation percentage) and soil hydraulic conductivity will be reduced.

An environmental guide for irrigated soils to optimize soil - water relationships is needed to prevent potential hazards