

CHAPTER 331

THE WATER UTILISATION (CONTROL AND REGULATION) ACT

[PRINCIPAL LEGISLATION]

ARRANGEMENT OF SECTIONS

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CHAPTER 331

THE WATER UTILISATION (CONTROL AND REGULATION) ACT 1

An Act to provide for water utilisation control and regulation.

[1st October, 1975]

[G.N. No. 241 of 1975]

Acts Nos.

42 of 1974

7 of 1981

10 of 1981

17 of 1989

8 of 1997

1 of 1999

20 of 2001

PART I

PRELIMINARY PROVISIONS (ss 1-3)

[PCh331s1]1. Short title

This Act may be cited as the Water Utilisation (Control and Regulation) Act.

[PCh331s2]2. Interpretation Acts Nos. 10 of 1981 s. 3 (a); 7 of 1981 3rd Sch.; 8 of 1997 s. 24;

20 of 2001 s. 54

(1) In this Act, unless the context otherwise requires—

"appointing authority" means in the case of the Chairman of the Central Water Board, the President and in the case of other members of every Basin Water Board, the Minister;

"Basin Water Board" means a Basin Water Board established under section 7 in relation to a water basin;

"Central Water Board" means the Central Water Board established by section 5;

"direct discharge" means the discharge of effluent into receiving water without prior treatment;

"domestic purposes" includes the watering, spraying and dipping of stock;

"easement" means a right to enter on the land of another for the purpose of constructing or maintaining works thereon or storing water thereon or carrying water under, through or over such land or for all or any of such purposes;

"effluent" includes any flowing-out or fluid material discharged from domestic or industrial waste systems which, by reason of its quality, quantity or characteristics, is likely to impair the beneficial use of receiving waters by adversely affecting their natural state;

"effluent treatment plant" means any device or structure designed for the treatment of effluent, removing matters in suspension, detoxicating or stabilising biodegradable organic impurities so as to prevent the occurrence of secondary decomposition upon the effluent mingling with water;

"EWURA" means the Energy and Water Utilities Regulatory Authority established by section 4 of the Energy and Water Utilities Regulatory Authority Act *;

"existing right" in relation to the use of water means a right, registered under the provisions of the Water Ordinance * hereby repealed and subsisting immediately prior to the date upon which this Act comes into operation, to divert, dam, store, abstract or use water;

"indirect discharge" means the discharge of effluent into a sewer leading to a municipal treatment plant;

"Minister" means the Minister responsible for water;

"national water supply" means a water supply declared as such under the provisions of section 9;

"Permanent Secretary" means the Permanent Secretary in the Ministry responsible for water;

"pollutant" means any substance or characteristic, whether or not harmful, added or imposed onto natural or supplied water;

"Principal Water Officer" means the Principal Water Officer appointed under the provisions of section 4;

"Regional Water Officer" means a Regional Water Officer appointed under the provisions of section 4;

"regional water supply" means a water supply other than a national water supply which is wholly or partly within a region;

"specified town" means any town or other water supply area declared under section 11(1) of the Urban Water Supply Act *, to be an area in which the supply of water is the responsibility of the Urban Water Authority;

"underground water" means water naturally stored or flowing below the surface of the ground;

"Urban Water Authority" means the National Urban Water Authority established by section 3 of the Urban Water Supply Act;

"water" means all water flowing over the surface of the ground or contained in or flowing in or from a spring or stream or natural lake or swamp or in or beneath a watercourse and all water made available from subterranean sources by means of works, but does not include any tidal water, nor water which is used solely for the purpose of extracting minerals therefrom;

"water basin" means any area of land delimited and declared by the Minister under section 7 to be a water basin in relation to any river or other water source;

"Water Officer" in relation to an application for, or an objection to, or a grant of, or refusal to grant, a water right in respect of a national water supply means the Principal Water Officer, and in relation to an application for, or an objection to, or a grant of, or refusal to grant, a water right in respect of a regional water supply, means the Regional Water Officer of the region in which such supply is situate;

"works" include canals, channels, reservoirs, embankments, weirs, dams, wells, boreholes and other works constructed for or in connection with the diversion, damming, storage or abstraction of water or for drainage or for the generation of water power or the use of water for industrial or other purposes or for the conservation of rainfall.

(2) [Repealed by Act No. 10 of 1981 s. 3(e).]

[PCh331s3]3. Application of Act to Government Act No. 10 of 1981 s. 4

Without prejudice to the generality of the application of this Act, it is hereby declared that the provisions of this Act shall apply to and be carried into effect by departments of the Government, public and local authorities, and all Water Authorities appointed under the Water Works Act *.

PART II

APPOINTMENT OF OFFICERS AND ESTABLISHMENT OF WATER ADVISORY BOARDS (ss 4-7)

[PCh331s4]4. Appointment of officers

(1) There shall be a Principal Water Officer and also, for every region in Tanzania, a Regional Water Officer who shall be appointed by the Minister from among persons in the public service.

(2) The Minister may appoint such other officers as, in his opinion, may be necessary for the purpose of the administration of this Act and the subsidiary legislation made hereunder.

(3) Officers appointed under this section shall have such functions as are conferred upon them by or under this Act.

[PCh331s5]5. Establishment of Central Water Board Acts Nos. 10 of 1981 s. 5; 8 of 1997 s. 26

(1) There is established a Central Water Board consisting of a Chairman who shall be appointed by the President, and not more than ten members who shall each be appointed by the Minister from public, private, non-governmental organisations and women organisations holding qualifications in scientific technical fields of learning or who has adequate knowledge and experience in the public affairs of Tanzania.

(2) Every member shall hold office—

(a) in the case of a member appointed in his own name until such time as the appointing authority revokes his appointment and appoints another person in his place;

(b) in the case of a member who is appointed by virtue of his holding some other office, until such time as he ceases to hold that other office.

(3) Where any member is, by reason of illness, infirmity or absence from the United Republic, unable to attend any meeting of the Central Water Board the appointing authority may appoint a temporary member in his place and the temporary member shall cease to hold office on the resumption of office of the substantive member.

(4) The Central Water Board shall elect one of its members to be the Vice-Chairman who shall, subject to his continuing to be a member, hold the office of Vice-Chairman for a term of two years from the date of his election and shall be eligible for re-election.

(5) The Central Water Board shall hold meetings on such occasions at such place as it may in its discretion determine.

(6) The business of the Central Water Board shall be conducted in such manner as the Minister may, by order published in the Gazette, prescribe, but where no procedure, is prescribed the Central Water Board shall conduct its business in such manner as it shall determine.

[PCh331s6]6. Functions of Central Water Board Act No. 8 of 1997 s. 27

(1) The Central Water Board shall be the principal advisory organ in matters relating to the utilisation of water, and shall have and exercise functions in relation to the control and regulation of water pollution subject to the provisions of this Act.

(2) In relation to the utilisation of water—

(a) the Central Water Board shall advise the Principal Water Officer on all matters concerning the appointment of national water supplies, the determination, diminution or modification of water rights, the measures to be taken in case of drought and the priorities to be given from time to time and in accordance with prevailing circumstances for the different purposes for which the water is required in any area of the United Republic;

(b) subject to paragraph (c), the Principal Water Officer shall consider the advice of the Central Water Board before granting or refusing any application for a water right, before determining revising, diminishing or modifying any water right or existing right and before specifying a quantity of water under section 24, but shall not be bound to follow that advice;

(c) nothing in paragraph (b) shall require the Principal Water Officer to make any reference to, or to consider the advice of the Central Water Board in respect of any suspension or variation of a right under section 23 or in respect of any modification, variation, determination or diminution of a right with the consent of its holder.

(3) In relation to the control and regulation of water pollution, the Central Water Board shall have power—

(a) to carry out, and promote the carrying out of research and investigations into the causes and ways for the efficient prevention or control, of water pollution in the United Republic;

(b) to formulate and recommend to the Government comprehensive plans for the regulation of the discharge of effluents by industrial trade and other categories of users of water;

(c) to formulate, and recommend to the Minister the best ways of ensuring compliance with, uniform procedure for the sampling and examination of water, sewage and industrial effluents, designating units for expressing results;

(d) to advise and assist the Government, public authorities and other persons or bodies of persons measures for the more efficient control or prevention of water pollution;

(e) to recommend to the Minister legislative measures necessary or suitable for the effective control of water pollution;

(f) to formulate effluent and receiving water standards, and programmes for ensuring compliance with those standards by domestic, commercial, industrial and other users of water;

(g) subject to the provisions of this Act, and of any other written law relating to the extraction, supply or use of water, to any other act or thing which, in the opinion of the Central Water Board, is necessary or expedient for the more effective control of water pollution in the United Republic.

[PCh331s7]7. Establishment, functions and proceedings of Basin Water Board Act No. 8 of 1997 s. 27

(1) The Minister may, by order published in the Gazette, declare any area of land to be a water basin in relation to any river.

(2) There shall be established a Basin Board in respect of each water basin declared under subsection (1) and the Minister shall in the order made under subsection (1), appoint not more than ten persons to be members of that Basin Board:

Provided that the composition of Basin Board shall not be more than ten members for bigger basins and not more than seven members for smaller basins regard being had that such members are drawn from public, private, non-governmental organisations and women organisations:

Provided further that the Basin Boards shall be financially and administratively autonomous.

(3) The provisions of sections 5 and 6(1) and (2) shall apply mutatis mutandis in relation to a regional water supply as if references in those provisions to the Central Water Board and to

the Principal Water Officer were references to a Basin Water Board and to a Regional Water Officer, subject to the preceding provisions of this section and to those of subsection (4).

(4) All the functions provided for or referred to in subsections (1) and (2) shall, in the application of that section to a Basin Water Board and a Regional Water Officer, be performed in relation to a regional water source only in so far as it is within the water basin concerned.

PART III

OWNERSHIP OF AND INHERENT RIGHTS TO THE USE OF WATER (ss 8-14)

[PCh331s8]8. All water vested in the United Republic

All water in Tanzania is vested in the United Republic.

[PCh331s9]9. Declaration of national water supplies

Where the Minister is of the opinion that it is in the public interest to regulate the use of water from any source in any area of Tanzania on a national basis, he may by notice in the Gazette, declare such source to be a national water supply for the purpose of this Act.

[PCh331s10]10. Right to water for domestic purposes

Any person having lawful access to any water may abstract and use the same for domestic purposes:

Provided that nothing in this section shall be construed as authorising the construction of any works.

[PCh331s11]11. Right to limited quantities of underground water and to casual water

(1) The owner or occupier of any land may—

(a) sink or enlarge any well or borehole thereon and abstract water therefrom, not exceeding 22,700 litres in any one day:

Provided that this section shall not authorise the sinking of any well or borehole within 230 metres of any other well or borehole or within 90 metres of any body of surface water or enlargement of any well or borehole which is within those distances from any other well or borehole or body of surface water, as the case may be;

(b) construct any works thereon for the conservation of rainfall, otherwise than in a river or stream and abstract and use the water so conserved.

(2) A Water Officer may determine for the purposes of paragraph (b) of subsection (1) whether any watercourse is a river or stream, and the determination of the Water Officer thereon shall be final and conclusive for the purposes of this Act.

[PCh331s12]12. Right to water for mining purposes

(1) The holder of a mining lease granted under the Mining Act * or of a lease granted under the Petroleum Exploration and Production Act * shall have in respect of the land comprised in his lease the same rights as are conferred by section 11 on the owner or occupier of any land and may also abstract and use any underground water encountered in any workings and construct any works required for or in connection with the use of such water.

(2) The holder of a claim registered under the Mining Act * or of a disc claim shall have in respect of the land comprised in such claim the same rights as are conferred on the holder of a lease by subsection (1) and may in addition, in respect of water to which he has lawful access, abstract and use the same for prospecting and mining purposes, returning the same to the stream or body of water from which it was taken, substantially undiminished in quantity.

(3) The holder of a prospecting right or of an exclusive prospecting licence granted under the Mining Act * or of a prospecting or exploration licence granted under the Petroleum Exploration and Production Act * may, within the area specified in such licence, subject to all other rights to the use of water—

(a) abstract and use for prospecting purposes any water to which he has lawful access, returning the same to the stream or body of water from which it was taken;

(b) sink or enlarge any well or borehole in any land on which he has the right to explore or prospect, and abstract water therefrom, not exceeding 22,700 litres in any one day; and

(c) abstract and use any underground water encountered in any workings and construct any works required for or in connection with the use of such water.

(4) Any person abstracting underground water from any workings under the powers conferred by this section shall comply with any directions of the Water Officer regarding the disposal of such water as is not used.

(5) Every person exercising the powers in this section shall, as regards the owners of any surface rights, exercise such powers and pay compensation in the same manner and to the same extent as if the powers exercised under this Act were exercisable under the Mining Act *.

[PCh331s13]13. Right to water for forestry purposes

The holder of an exclusive licence to take trees and timber granted under the Forests Act * may, within the area specified in such licence, subject to all other rights to the use of water—

(a) abstract and use any water to which he has lawful access—

(i) for logging or sawmilling operations of a temporary nature:

Provided that no such operation shall be deemed to be of a temporary nature unless no substantial plant is maintained in any one place for more than one year nor is intended to be so maintained; or

(ii) for fighting forest fires; or

(b) sink or enlarge any well or borehole and abstract water therefrom not exceeding 22,700 litres in any one day.

[PCh331s14]14. Prohibition of use of water except with lawful authority

Subject to the provisions of this Part and to the provisions of section 53 of the Mining Act *, no person shall divert, dam, store, abstract or use water or for any such purpose construct or maintain any works, except in accordance with an existing right or with a water right granted under this Act.

PART IV

GRANT OF WATER RIGHTS (ss 15-21)

[PCh331s15]15. Grant of water rights

(1) A Water Officer may grant to any person the right to divert, dam, store, abstract and use water from such source, in such quantity, for such period, whether definite or indefinite, and for such purpose as may be specified in the water right, subject to such terms and conditions as he may deem fit.

(2) Upon receipt of an application for the grant of a water right, the Water Officer shall give notice of the same in the prescribed manner. Any interested person may notify the Water Officer that he objects to the grant of a water right and may specify the grounds for such objection, and shall, if he so required, have a right to be heard thereon by the Basin Water Board.

(3) The Water Officer—

(a) shall consider every application and any objections made to him in respect thereof, and shall refer the same to the Water Advisory Board; and

(b) may, after considering the advice of the Basin Water Board, grant such right as he may consider appropriate or may dismiss the application.

(4) Nothing in any such water right shall be deemed to imply any guarantee that the quantity of water thereon referred to is or will be available.

[PCh331s16]16. Consent for discharges Act No. 10 of 1981 s. 6

(1) No person may discharge effluent from any commercial, industrial or other trade wastes systems into receiving waters without a consent duly granted by a Water Officer under this section.

(2) Upon receipt of an application for the grant of a consent to discharge, the Water Officer shall give notice of application in the prescribed manner. Any interested person may notify the Water Officer that he objects to the grant of a consent to discharge and may specify the grounds for such objection, and shall, if he so requires, have a right to be heard on the objection by the Central Water Board or the Basin Water Board concerned, as the case may be.

(3) A consent to discharge granted under this section shall entitle the person to whom it is granted to discharge effluent into any underground stratum subject to the provisions of section 20.

(4) The Minister may make provisions regulating the procedure for making and considering applications for the grant of consents to discharge, the making of objections to any such application, the making of appeals against refused applications or conditions imposed on consents granted, and any other matters related to or grant of consents to discharge.

[s. 15A]

[PCh331s17]17. Right may be made appurtenant to land

(1) A Water Officer may, either at the time of the grant or at any time after the grant of any water right, declare that such right shall be appurtenant to land described in the water right and may at any time declare an existing right to be appurtenant to land affected thereby.

(2) Where a water right or existing right has been declared to be appurtenant to any land, the benefit of the right shall be enjoyed and the right may be enforced by the person who is for the time being entitled to the possession of the land.

(3) Where in consequence of any transfer, lease or partition, any person becomes entitled to the possession of part of the land to which a water right or existing right has been declared appurtenant, he may abstract and use such proportion of the water the abstraction and use of which is permitted by the water right or existing right as may have been assigned to him in the transfer, lease or partition or as may be agreed between him and the persons entitled to the possession of the remainder of the land, or, in the absence of any such assignment or agreement, as may be determined by the Water Officer.

(4) Where any apportionment of water has been made under the provisions of this subsection in respect of any partition of land, the several amounts of water so apportioned shall be deemed to be appurtenant to the several parcels of such land and the benefit thereof shall be enjoyed and all rights thereof may be enforced, in accordance with such apportionment by the persons who are for the time being entitled to the possession of such parcels, and such rights shall prevail until the parcels shall again become merged with each other.

(5) Any person acquiring a right to abstract and use water by agreement in accordance with the provisions of subsection (3) of this section shall within thirty days give notice thereof in the prescribed form to the Water Officer.

[PCh331s18]18. Conditions implied in certain rights Act No. 10 of 1981 s. 7

The following conditions shall be implied in every water right granted for mining, forestry or industrial purposes or for the generation of power—

(a) that the water used thereunder—

(i) shall be returned to the stream or body of water from which it was taken or to such other stream or body of water as may be authorised by the Water Officer;

(ii) shall be substantially undiminished in quantity;

(iii) shall not be polluted with any matter derived from such use to such extent as to be likely to cause injury either directly or indirectly to public health, to livestock or fish, to crops, orchards or gardens which are irrigated by such water or to any product in the processing of which such water is used;

(iv) shall, before its direct discharge into receiving waters, be so treated or otherwise modified as to comply with prescribed effluent and receiving water standards;

(b) that precautions shall be taken to the satisfaction of the Water Officer to prevent accumulations in any river, stream or water-course of silt, sand, gravel, stones, sawdust refuse, sewage, sisal waste or any other substance likely to affect injuriously the use of such water;

(c) that the owner of the water right shall make periodical returns to the Water Officer in such form and at such intervals as the Minister may prescribe, setting out the nature of wastes or effluent produced by his use of the water; and

(d) that the owner of the water right shall install or facilitate the installation at the point of discharge all machinery and other facilities necessary for the taking of samples and the collection and treatment of effluent.

[s. 17]

[PCh331s19]19. Rights conditional on construction of works

(1) Where a Water Officer has granted a water right subject to the construction of works within a specified period, he may, from time to time at any time notwithstanding that the period previously allowed may have expired, extend the period for the construction of such works.

(2) At the expiration of the period allowed for the construction of the works, the Water Officer shall cause the works to be inspected by such officer as the Permanent Secretary may approve who, if they have been constructed to his satisfaction, shall so certify in writing to the Water Officer.

(3) No certificate issued under this section shall be deemed to imply any guarantee by the Government that the works are properly designed or constructed nor shall support justify any claim whatsoever against the Government or any Government officer in connection with such works.

[s. 18]

[PCh331s20]20. Restriction on discharge into underground strata Acts Nos. 10 of 1981 s. 8; 1 of 1999 s. 14; 20 of 2001 s. 55

(1) No person to whom a consent to discharge is granted under section 16 may construct or discharge into an underground water body within 230 metres of any well or borehole or any other water body or within 90 metres of any body of underground water or enlargement of any well, borehole or other water body which is within those distances from any other well or borehole or body of underground water, as the case may be.

(2) EWURA may, upon recommendations by the Central Water Board, make provisions for the regulation of discharge of effluent into underground strata.

[s. 18A]

[PCh331s21]21. Declaration of standards

(1) The standards specified in the First and the Second Schedule to this Act shall be standards in respect of effluent and receiving water, respectively, which shall be complied with by users of water before or during discharge into water courses, receiving waters or sewers.

(2) The Minister may, by order published in the Gazette, add to, vary or replace any of the provisions of the First and the Second Schedules.

(3) [Repealed by Act No. 8 of 1997 s. 28.]

[s. 18B]

PART V

REVISION, VARIATION, DETERMINATION AND DIMINUTION OF WATER RIGHTS (ss 22-29)

[PCh331s22]22. Position when volume inadequate to satisfy all rights granted in respect thereof

If, at any time, in the opinion of the Minister, in any specified area, the volume of water to which rights of use exist is insufficient to satisfy all such rights, he may direct the appropriate Water Officer to review the use, diversion, control and appropriation of water in that area and in so doing the Water Officer may revise the quantity allowed by any right and the terms and conditions of any right to the use of water in that area:

Provided that the Water Officer shall have regard to the principle that where beneficial use of the whole right has been maintained, no right shall be cancelled or reduced except in proportion with all other rights in the same area.

[s. 19]

[PCh331s23]23. Suspension or variation of rights on account of drought

Where in the opinion of the Water Officer on account of drought the supply water from any source is insufficient or likely to become insufficient for the needs of the persons using it, the Water Officer may at any time and from time to time, by notice in writing addressed to the holders of water rights suspend or vary all or any rights to abstract or use water from that source, for such period as he may deem necessary, and thereupon such rights shall cease for the period of the suspension or shall be exercisable only as varied, as the case may be.

[s. 20]

[PCh331s24]24. Where quantity unspecified Water Officer may specify quantity

In respect of any existing right to the use of an unspecified quantity of water, the Water Officer may at any time specify the quantity of water for which that right shall be valid, and record the same in the register of water rights and so to inform the holder of that existing right.

[s. 21]

[PCh331s25]25. Variation of water rights with consent

A Water Officer may at any time on the application or with the consent of the holder of a water right, determine or diminish the right or vary any of the conditions thereof.

[s. 22]

[PCh331s26]26. Determination for breach of condition

Where the holder of a water right has failed to comply with any condition, express or implied, subject to which the right was granted, or has abstracted or used water in excess of that authorised or has used water for a purpose not authorised by the grant, the Water Officer may by notice in writing addressed to the holder declare the right to be determined:

Provided that where the default is one capable of being remedied, the Water Officer shall first serve on the holder notice in writing specifying the default and requiring the holder to remedy the same within such time as may be specified in the notice.

[s. 23]

[PCh331s27]27. Determination or diminution for non-use

(1) If at any time a Water Officer has reason to believe that the holder of a water right has not, during the preceding three years, made full beneficial use of that right, the Water Officer may by notice in writing addressed to such holder call upon him to show cause why such right should not be determined or diminished or modified in such respects as may be specified in the notice.

(2) If within three months of the service of such notice no reply has been received by the Water Officer, he may declare the right determined or diminished or modified, as the case may be.

(3) The holder of a water right upon whom a notice has been served under subsection (1) may, within three months of such service, submit to the Water Officer a statement in writing of reasons why the right should not be determined or diminished or modified, as the case may be, or may require to be heard in the matter.

(4) The Water Officer shall consider any statement submitted to him under subsection (3) and shall, if so required, give the holder an opportunity of being heard in person or by an advocate and may thereafter by notice in writing addressed to the holder—

- (a) declare the right determined; or
- (b) declare the right diminished or modified in such respects as may be specified in the declaration; or
- (c) declare the right to be subsisting unchanged.

[s. 24]

[PCh331s28]28. Determination or diminution for public purposes

(1) Where a Water Officer is satisfied that water is required for a public purpose he may, by notice in writing addressed to the holder of any water right, determine or diminish that right to the extent that such water is required for the aforesaid public purpose, and thereupon the right shall cease or shall be exercisable only as so diminished, as the case may be.

(2) The holder of any right determined or diminished under the provisions of this section shall be entitled to receive compensation from the Government for all loss resulting from the determination or diminution of the right. The amount of compensation payable shall in the absence of agreement be determined by the High Court upon the application of the holder or the Minister.

(3) The Minister may by notice in the Gazette declare any purpose to be a public purpose within the meaning of this section.

[s. 25]

[PCh331s29]29. Application of Part V to existing rights

The provisions of this Part shall apply to all existing rights in the same manner as they apply to water rights granted under this Act.

[s. 26]

PART VI

MISCELLANEOUS POWERS (ss 30-34)

[PCh331s30]30. Power to create easements

(1) Where any person who is the holder of a water right or who has applied for the grant of water right is unable fully to enjoy the benefit of that right without an easement, and has failed to secure an easement by agreement with the owner or occupier of the land over which the easement is required, he may apply to the appropriate Water Officer for the creation of such easement.

(2) Upon receipt of any such application, the Water Officer shall serve notice of the application on the owner or occupier of the land over which an easement is sought and on any other persons known to be interested in that land.

(3) Any interested person may notify the Water Officer that he objects to the creation of an easement under this section or that he desires to be heard on the subject of compensation.

(4) The Water Officer shall consider any objections made to him and shall give an opportunity of being heard to all persons who so require, and may thereafter by a certificate in the prescribed form create such easement as he may consider appropriate or refuse to create an easement.

(5) Where the water right in respect of which an easement is created has been made appurtenant to the land of the holder of the water right, then an easement created by the Water Officer may also be made appurtenant to such land, but not otherwise.

(6) Every easement created under this section shall be subject to the payment of such compensation, either by way of a capital sum or of periodical payments, as the Water Officer may decide, to such persons as the Water Officer may consider to be injuriously affected by the creation of the easement and in such proportion as the Water Officer may decide and may be made conditional on the construction and maintenance of such bridges and other works as may in the opinion of the Water Officer be necessitated by the severance of the land subject to the easement.

(7) If the person enjoying the benefit of an easement fails to pay such compensation as directed or to construct such bridges and other works within such time as is therefor allowed by the Water Officer, or fails to maintain or repair such bridges or other works after being required so to do by the Water Officer, the Water Officer may by notice in writing addressed to that person determine the easement.

(8) Any compensation due under this section which remains unpaid may be sued for as a civil debt.

(9) Any easement created by agreement between the holder of a water right and any other person may be made appurtenant to the land of the holder of the water right where the water right in respect of which the agreement is made is appurtenant to such land:

Provided that no such agreement shall operate to create an easement appurtenant to the land unless and until a copy of the agreement shall have been forwarded to the Water Officer by the holder of the water right.

[s. 27]

[PCh331s31]31. Right to call for information Act No. 10 of 1981 s. 10

A Basin Water Board, or a Water Officer may, for the purpose of this Act, call upon any person to give information on such matters and in such manner as may be prescribed.

[s. 28]

[PCh331s32]32. Power to inspect works

(1) A Water Officer and all persons authorised by him in writing and such officers as the Permanent Secretary shall approve may, at all reasonable times, enter upon any land and may inspect any works constructed or under construction thereon and may take measures to ascertain the amount of water abstracted or capable of being abstracted by means of such works or otherwise.

(2) If in the opinion of the Water Officer any works are so constructed, maintained or used or are being so constructed as to constitute a danger to life, health or property, he may require any person for the time being enjoying the benefit of those works to carry out such repairs or to effect such additions or modifications to such works or to carry out such demolitions or to change the use of the works in such manner as he may consider necessary and may by notice in writing suspend any water right until he is satisfied that such requirement has been fulfilled, and thereupon the right shall cease for the period of the suspension.

(3) No compensation shall be payable to the owner or occupier of any land by reason that entry has been made upon such land in pursuance of the provisions of subsection (1) of this section.

[s. 29]

[PCh331s33]33. Power to require demolition of unlawful works

(1) A Water Officer may by notice in writing require any person—

(a) who has constructed or extended or caused to be constructed or extended any works contrary to the provisions of this Act or of any other written law, not inconsistent with the provisions of this Act, under which such person was required or authorised to construct or extend the same or cause them to be constructed or extended; or

(b) whose water right or existing right in respect of which any works are in existence has been determined under the provisions of this Act or has otherwise come to an end, to modify, demolish or destroy such works within such period, not being less than thirty days, as may be specified in the notice.

(2) If any person fails to comply with a notice served on him under subsection (1) of this section, it shall be lawful for the Water Officer to cause such works to be modified, demolished or destroyed and to recover the cost of the modification, demolition or destruction from the person in default by civil suit.

[s. 30]

[PCh331s34]34. Power to establish hydrographic stations and make surveys

(1) The Permanent Secretary and all persons authorised by him may at all reasonable times enter upon any land for the purpose of making such investigations and surveys as the Permanent Secretary may consider necessary in the interest of the conservation and best use of water, and may establish and maintain on any such land, without other authority than this Act, hydrographic stations and other works for the purpose of obtaining and recording information and statistics as to hydrographic conditions.

(2) No compensation shall be payable to the owner or occupier of any land by reason that entry has been made upon such land in pursuance of the provisions of subsection (1) of this section but compensation shall be payable for all damage done and for any land occupied for the construction of works. In the absence of agreement such compensation shall be determined by the High Court on the application of the owner or occupier or of the Minister.

[s. 31]

PART VII

APPEALS (s 35)

[PCh331s35]35. Appeals Act No. 10 of 1981 s. 9

(1) The Minister shall make provision for the procedure of making and hearing appeals arising from decisions of the Central Water Board and Basin Water Boards and may, for that purpose, establish an appeals committee or committees and provide for the exercise of the powers and the regulation of the procedure, of the committee or committees, as the case may be.

(2) Any person who is aggrieved by the refusal of a Water Officer to grant or renew a water right, or by any conditions imposed when granting or renewing a water right, or by the determination or diminution or modification or suspension of any water right, or by the grant of or refusal to grant any easement or by the conditions subject to which any easement is created, or by any direction regarding the disposal of underground water abstracted from any workings or by any requirement that any work should be repaired, added to, altered, demolished or destroyed, or that the use of any works be changed, may appeal to the appellate authority whose decision in the matter shall be final.

(3) Notwithstanding the provisions of subsection (1) of this section, no person may appeal against the grant or renewal of a water right or the grant of any easement, who did not make objection to such grant or renewal to the Water Officer under the provisions of subsection (2) of section 15 or subsection (3) of section 30, as the case may be.

(4) In this section, "appellate authority" means, in the case of an appeal against a decision of the Principal Water Officer, the Minister, and in the case of an appeal against a decision of a Regional Water Officer, the Regional Commissioner of the region in which the relevant regional water supply is situate.

[s. 32]

PART VIII

OFFENCES (s 36)

[PCh331s36]36. Offences and penalties Acts Nos. 17 of 1989 Sch.; 8 of 1997 s. 29

(1) Any person who in order to procure the grant of a water right wilfully makes any statement knowing the same to be false in any material particular or not having reason to believe the same to be true shall be guilty of an offence and liable upon conviction to a fine not exceeding five hundred thousand shillings or to imprisonment for a period not exceeding three years or to both such fine and imprisonment.

(2) Any person who constructs or extends any works contrary to this Act or fails, without reasonable excuse, to comply with a requirement made under section 32 or wilfully obstructs, damages or destroys any works or destroys, defaces or moves any level mark, beacon or other structure or appliance or obstructs, molests or hinders any public officer in the lawful exercise of his powers or duties under this Act shall be guilty of an offence and liable upon conviction to a fine not exceeding two hundred and fifty thousand shillings or to imprisonment for a period not exceeding two years, or to both such fine and such imprisonment or in the case of a second or subsequent conviction to a fine not exceeding one hundred thousand shillings or to imprisonment for a period not exceeding three years, or to both such fine and imprisonment, and in every case where the offence is a continuing one to an additional fine not exceeding five hundred shillings in respect of every day during which the offence has continued.

(3) Any person who contrary to the provisions of this Act, diverts, dams, stores, abstracts or uses water or who, being the holder of an existing right or a water right granted under this Act or the occupier of any land to which an existing right or a water rights has been made appurtenant, abstracts or uses water in excess of that authorised or for a purpose other than that authorised commits an offence and liable upon conviction to a fine not exceeding three hundred thousand shillings or in the case of a second or subsequent offence to such fine or to

imprisonment for a term not exceeding two years or to both such fine and imprisonment, and in every case where the offence is a continuing one to an additional fine not exceeding two hundred shillings in respect of every day during which the offence has continued.

(4) Any person who pollutes the water in any river, stream or water course or in any body of surface water to such extent as to be likely to cause injury directly or indirectly to public health, to livestock or fish, to crops, orchards or gardens which are irrigated by such water or to any products in the processing of which such water is used shall be guilty of an offence and liable on conviction to a fine not exceeding one million five hundred thousand shillings or to imprisonment for a term of three years or to both fine and imprisonment and in case of subsequent conviction, to a fine not exceeding two million shillings or to imprisonment not exceeding three years or to both fine and imprisonment and in case of continuation of the offence, to an additional fine not exceeding fifty thousand shillings in respect of every day during which the offence has continued.

(5) Any person who being required to give information under any provision of this Act or under any regulation made under this Act refuses without reasonable excuse to give such information or gives information knowing the same to be false, or having reason to believe the same not to be true, shall be guilty of an offence and liable upon conviction to a fine not exceeding two hundred thousand shillings or to imprisonment not exceeding three years or to both such fine and imprisonment.

(6) Any person who by overt act or writing, threatens, incites intimidates or prevents construction of any works or watergate approved by the Principal Water Officer is guilty of an

offence and is liable on conviction, to a fine not exceeding one hundred thousand shillings or to imprisonment for a term not exceeding six months or to both fine and imprisonment and in case of subsequent conviction to a fine not exceeding two hundred thousand shillings or to imprisonment for a term not exceeding one year.

[s. 33]

PART IX

MISCELLANEOUS PROVISIONS (ss 37-42)

[PCh331s37]37. Registration

(1) Every Water Officer shall keep a register for the registration of every grant or renewal of water right made by him and of the variation, determination or modification or suspension of a water right or existing water right, and of any easement created or determined by him.

(2) The Principal Water Officer shall establish a central registry of water rights registered under this Act.

(3) Every Regional Water Officer shall supply without delay to the Principal Water Officer a copy of every entry made in his register of water rights and shall, upon application being made to him by any other Regional Water Officer or public officer, forthwith provide without fee a copy of any entry in his register of water rights.

(4) Any person shall, on application to a Water Officer, be entitled to receive certified or uncertified extracts from the register of water rights maintained by such Water Officer.

(5) Extracts from any register of water rights certified to be under the hand of a Water Officer shall be admissible in evidence in all legal proceedings, civil or criminal, without proof that they are under the hand of the Water Officer purported to have certified the same and shall also be prima facie evidence of the facts recorded therein.

(6) The entry of any easement in a register of water rights under this section shall not affect any requirements as to registration contained in, or be construed as being an effective registration for the purposes of, or in lieu of registration under the provisions of, the Registration of Documents Act * or the Land Registration Act. *

[s. 34]

[PCh331s38]38. Service of notices

A notice under this Act shall be deemed to have been served on, or given to, any person—

- (a) if served on him personally; or
- (b) if left for him at his last known address; or
- (c) if sent by registered post addressed to his last known address.

[s. 35]

[PCh331s39]39. Civil liability not affected

Subject to any express provisions in this Act, nothing contained in this Act shall affect the civil liability of any person for any damage resulting from the construction, alteration or

destruction of any works or the failure to maintain the same in proper repair or from the obstruction, storage or diversion of any water.

[s. 36]

[PCh331s40]40. Indemnity

Without prejudice to the provisions of section 284A of the Penal Code * or of the Public Officers (Recovery of Debts) Act *, no member of a Water Advisory Board or public officer shall be personally liable for any act or default which is done or omitted to be done in good faith in the exercise or purported exercise of the powers conferred by this Act.

[s. 37]

[PCh331s41]41. Power to make rules and regulations Act No. 8 of 1997 s. 30

(1) The Chief Justice may make rules of court for regulating proceedings before the High Court and applications thereto under the provisions of this Act and for the fees to be paid in respect thereof.

(2) Subject to the provisions of subsection (1), the Minister may make regulations prescribing anything which may be prescribed under this Act and for the better carrying into effect of the provisions on this Act, and, without prejudice to the generality of the foregoing, such regulations may—

(a) prescribe the registers and records to be kept and the manner in which they are to be kept;

(b) provide for the forms to be used and the fees to be paid and be used in respect of any matter required or permitted to be done under this Act;

(c) provide for the advertisement of applications for the use of water and for the giving of notice to interested persons;

(d) provide for and regulate the making of objections to a Water Officer and the time within which such objections shall be made;

(e) regulate the procedure of appeals under section 3 of this Act;

(f) provide for the formation, functions and conduct of local associations of water users;

(g) in the case of a water right or existing right enjoyed by an association of persons, regulate the division and distribution of water between those persons;

(h) prescribe the matters on which and the manner in which persons may be required to give information as provided in section 31;

(i) prescribe the quorum of, and the procedure to be adopted by Basin Water Board, the manner in which and the extent to which they shall receive evidence and hear arguments by objectors and others, and the manner in which they shall record their findings;

(j) provide for the transfer, to the land register under the Land Registration Act * or to a register maintained under the Registration of Documents Act *, of particulars of easements

which were registered in the Water Grants record maintained under the Water Act hereby repealed and which subsist on the date upon which this Act comes into operation.

[s. 38]

[PCh331s42]42. Repeal of R.L. Cap. 410 and savings

[Repeals the Water Ordinance with savings.]

[s. 39]

FIRST SCHEDULE

EFFLUENT STANDARDS

(Section 21(1))

Maximum permissible value

Substance/Characteristic	Unit	Effluent meant for direct discharge into receiving waters
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Trade and industrial effluents meant for indirect discharge into receiving waters, e.g. via a municipal sewage treatment plant		
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A2.2.1.

A2.2.1.1 General

Suspended solids

mg/l

not to cause or form sludge or scum in the receiving water No limit

A2.2.1.2 Colour Number (Pt-Co scale) not to cause change in the natural colour of the receiving water 100

A2.2.1.3 Taste and odour - not to cause any change in the natural taste or odour of the receiving water

A2.2.1.4 Temperature °C not to cause any increase in the temperature of the receiving water by more than 5°C 35°C or not more than 5°C above ambient temperature of the supplied water, whichever is greater

A2.2.1.5 Total dissolved mg/l 3000; no restrictions for discharge into the sea
7,500

A2.2.1.6 pH - 6.5-8.5

A2.2.1.7 BOD 5 days, 20°C mg/l 30

BOD 5 days, 25°C mg/l 34 No limit

BOD 5 days, 30°C mg/l 37 No limit

BOD 5 days, 35°C mg/l 40 No limit

A2.2.1.8 Permanganate value mg/l 80 No limit

Inorganic Substances

A2.2.2.1	Aluminium (Al)	mg/l	2.0	5.0
A2.2.2.2	Arsenic (As)	mg/l	0.1	0.1
A2.2.2.3	Barium (Ba)	mg/l	1.5	3.0
A2.2.2.4	Cadmium (Cd)	mg/l	0.1	0.1
A2.2.2.5	Chromium III (Cr ³⁺)	mg/l	0.1	2.0
A2.2.2.6	Cobalt (Co)	mg/l	1.0	1.0
A2.2.2.7	Copper (Cu)	mg/l	1.0	1.0
A2.2.2.8	Iron (Fe)	mg/l	3.0	5.0
A2.2.2.9	Lead (Pb)	mg/l	0.2	0.2
A2.2.2.10	Manganese (Mn)	mg/l	3.0	5.0
A2.2.2.11	Mercury (Hg)	mg/l	0.005	0.005
A2.2.2.12	Nickel (Ni)	mg/l	0.2	0.5
A2.2.2.13	Selenium (Se)	mg/l	0.5	1.0
A2.2.2.15	Silver (Ag)	mg/l	0.1	0.1
A2.2.2.16	Tin (Sn)	mg/l	2.0	2.0
A2.2.2.17	Vanadium (V)	mg/l	1.0	1.0

A2.2.2.18	Zinc (Zn)	mg/l	1.0	1.0
A2.2.2.19	Ammonia + Ammonium			
(NH ₃ +NH ₄)	mg/l	10	No limit	
A2.2.2.20	Chlorides (Cl)	mg/l	800	800
A2.2.2.21	Free chlorine	mg/l	1.0	5.0
A2.2.2.22	Cyanides (Cn)	mg/l	0.1	0.2
A2.2.2.23	Nitrates (NO ₃)	mg/l	50	80
A2.2.2.24	Nitrates (NO ₂)	mg/l	1.0	10
A2.2.2.25	Phosphates (PO ₄ -)	mg/l	6.0	0.5
A2.2.2.26	Sulphates (SO ₄ -)	mg/l	600	600
A2.2.2.27	Sulphides (S-)	mg/l	0.5	1.0

Organic Substances

A2.2.3.1	Alkybenzyl sulphonate ABS	mg/l	2.0	5.0
A2.2.3.2	Aromatic and aliphatic hydrocarbons	mg/l	1.0	5.0
A2.2.3.3	Aromatic nitrogen-containing compounds (e.g. aromatic amines)	mg/l	0.05	0.05
A2.2.3.4	Chloroform extract (CE)	mg/l	5.0	10

A2.2.3.5	Formaldehyde	mg/l	1.0	1.0
A2.2.3.6	Grease and oils (petroleum ether extract)	mg/l	5	10
A2.2.3.7	Non-volatile chlorinated compounds (Cl)	mg/l	0.05	0.05
A2.2.3.8	Organochlorine pesticides (Cl)	mg/l	0.005	0.005
A2.2.3.9	Other pesticides	mg/l	0.01	0.01
A2.2.3.10	Phenols	mg/l	0.2	1.0
A2.2.3.11	Resins, tar, etc.	mg/l	2.0	5.0
A2.2.3.12	Volatile chlorinated hydrocarbons (Cl)	mg/l	0.05	0.05

SECOND SCHEDULE

STANDARDS FOR RECEIVING WATERS

(Section 21(1))

Category 1: Water suitable for drinking water supplies, swimming pools, food and beverage manufacturing industries, pharmaceutical manufacturing industries or industries requiring a water source of similar quality.

Category 2: Water suitable for use in feeding domestic animals, in fisheries, shell cultures, recreation and water contact sports.

Category 3: Water suitable for irrigation and other industrial activities requiring water of standards lower than those of water in category 1 or 2.

Substance	Characteristic	Unit	Maximum Permissible Concentration		
			Category 1	Category 2	Category 3

A2.1.1 General

A2.1.1.1 Suspended matter turbidity mg/l

(as SiO₂) discharge of effluent shall not cause formation of sludge or scum in the receiving water

A2.1.1.2 Colour Number (Pt-Co scale) discharge of effluent shall not cause any change in the natural colour of the receiving water

A2.1.1.3 Taste and odour – discharge of effluent shall not cause change in the natural taste or odour of the receiving water

A2.1.1.4 Temperature °C discharge of effluent shall not raise the temperature of the receiving water by more than 5°C

A2.1.1.5 Total dissolved solids mg/l 2,000 2,000 No limit

A2.1.1.6	pH	-	6.5-8.5	6.5-8.5	6.5-9.0
A2.1.1.7	Dissolved oxygen	mg/l	6	5	3
A2.1.1.8	Oxygen solution	%	80	60	40
A2.1.1.9	BOD 20°C				
-5 days	mg/l	5	5	10	
	25°C				
-5 days	mg/l	6	6	12	
	30°C				
-5 days	mg/l	6	6	12	
	35°C	mg/l	7	7	13
A2.1.1.10	Permanganate value	mg/l	20	20	30
A2.1.2.	Inorganic substance	mg/l	03	03	03
A2.1.2.1	Aluminium (Al)	mg/l	03	03	03
A2.1.2.2	Arsenic (As)	mg/l	0.05	0.1	0.1
A2.2.3	Barium (Ba)	mg/l	1.0	1.0	1.5
A2.1.2.4	Boron (B)	mg/l	1.15	1.5	1.5

A2.1.2.5	Cadmium (Cd)	mg/l	0.03	0.1	0.2
A2.1.2.6	Chromium III (Cr ³⁺)	mg/l	0.1	0.3	0.5
A2.1.2.7	Chromium VI (Cr ⁶⁺)	mg/l	0.05	0.1	0.1
A2.1.2.8	Cobalt (Co)	mg/l	0.1	0.1	0.5
A2.1.2.9	Copper (Cu)	mg/l	3.0	3.0	4.0
A2.1.2.10	Iron (Fe)	mg/l	1.0	1.2	1.5
A2.1.2.11	Lead (Pb)	mg/l	0.1	0.1	0.2
A2.1.2.12	Manganese (Mn)	mg/l	0.5	0.8	0.8
A2.1.2.13	Mercury (Hg)	mg/l	0.001	0.001	0.005
A2.1.2.14	Nickel (Ni)	mg/l	0.05	0.05	0.1
A2.1.2.15	Selenium (Se)	mg/l	0.05	0.05	0.5
A2.1.2.16	Silver (Ag)	mg/l	0.05	0.05	0.05
A2.1.2.17	Tin (Sn)	mg/l	0.5	0.5	0.1
A2.1.2.18	Vanadium (V)	mg/l	0.005	0.005	0.01
A2.1.2.19	Zinc (Zn)	mg/l	0.2	0.2	1.0
A2.1.2.20	Ammonia + Ammonium				

(NH₃+NH₄) mg/l 0.5 0.5 2.0

A2.1.2.21 Chlorides (Cl) mg/l 200 200 400

A2.1.2.22 Fluorides (Fl) mg/l 8.0 8.0 8.0

A2.1.2.23 Cyanides(Cn) mg/l 0.05 0.05 0.1

A2.1.2.24 Nitrates (NO₃) mg/l 50 50 100

A2.1.2.25 Nitrites (NO₂) mg/l as low as is required to prevent eutrophication or excessive weed growth if nitrogen is a limiting nutrient in waters which are susceptible to eutrophication or excessive weed growth, or in rivers and streams draining into such waters.

A2.1.2.26 Phosphates (PO₄) mg/l the lowest possible concentration should be aimed at if phosphorus is a limiting nutrient.

A2.1.2.27 Sulphates (SO) mg/l 600 600 600

A2.1.2.28 Sulphides (S-) mg/l 0.01 0.01 0.1

A2.1.3 Organic substances

A2.1.3.1 Alkylbenzene sulphonates (ABS) mg/l 0.5 0.1 1.0

A2.1.3.2 Aromatic and aliphatic hydrocarbons mg/l 0.05 0.05 0.1

A2.1.3.3 Aromatic nitrogen containing compounds (e.g. aromatic amines) mg/l 0.01 0.01 0.1

A2.1.3.4 Chloroform extract (CE) mg/l 0.5 0.5 0.10

A2.2.1.3.5	Formaldehyde	mg/l	0.2	0.2	0.5
A2.1.3.7	Non-volatile chlorinated compounds (Cl)	mg/l	0.005	0.005	0.10
A2.1.3.8	Volatile chlorinated hydrocarbons (Cl)	mg/l	0.005	0.005	0.01
A2.1.3.9	Organochlorine pesticides (Cl)	mg/l	0.0005	0.0005	0.001
A2.1.3.10	Other pesticides	mg/l	0.001	0.001	0.005
A2.1.3.11	Phenols	mg/l	0.002	0.002	0.1
A2.1.3.12	Resins, tar, etc.	mg/l	0.1	0.1	0.5

TEMPORARY STANDARDS OF QUALITY OF DOMESTIC WATER

International

(WHO 1963) Tanzania Standard Rural Water

Group No.	Substance	Units	Allowable		Standard	
TOXIC SUBSTANCES	1.	Lead Pb	mg/l	0.05	0.1	
	2.	Arsenic As	mg/l	0.05	0.05	
	3.	Selenium Se	mg/l	0.1	0.5	

4.	Chromium VI (Cr ⁶⁺)	mg/l	0.05	0.05
5.	Cyanide Cn	mg/l	0.2	0.02
6.	Cadmium Cd	mg/l	0.01	0.05
7.	Barium Ba	mg/l	1.0	1.0
8.	Mercury Hg	mg/l	–	–
9.	Silver Ag	mg/l	–	–

AFFECTING HUMAN HEALTH 1. Fluoride mg/l 1.5 8.0

2. Nitrate (NO₃) mg/l 30.0 30/100

ORGANOLEPTIC 1. Colour mg/l 50 50

2. Turbidity (SiO₂) mg/l 25 30

3. Taste mg/l – Unobjec-

tionable

4. Odour –

AFFECTING POTABILITY AND SUITABILITY OF WATER FOR GENERAL DOMESTIC

USE 5. pH - Salinity and Hardness mg/l 6.5–9.2 6.5-9.2

6. Total Filterable Residue mg/l 1,5000 200

7. Total Hardness (Ca₂Co₃) mg/l – 600

8. Calcium Ca mg/l 200 –

9. Magnesium Mg mg/l 150 300

10. Sodium Na mg/l 1,000 1,000

11. Sulphate SO₄ mg/l 400 600

12. Chloride Cl mg/l 600 0.5

LESS TOXIC METALS 13. Iron Fe mg/l 1.0 1.5

14. Manganese Mn mg/l 0.5 0.0

15. Copper Cu mg/l 1.55 3.0

16. Zinc Zn mg/l 15 15

ORGANIC POLLUTION - NATURAL 17. BOD (5 days, at 65°F) mg/2/l

6 6.0

18. PV (Oxygen Abs. KMnO₄) mg/2 10 2.0

19. Ammonium (NH₃+NH₄) mg/l 0.5

20. Total Nitrogen (excluding NO₃) mg/l 0.1 1.0

ORGANIC POLLUTION INTRODUCED ARTIFICIALLY 21. S u r f a c t a n t s

(Alkylbenzyl sulphonates) mg/l 1.0 3.0

22. Organic matter (as carbon in chloroform extract) mg/l 0.5 0.5

23. Phenolic substance (as phenol) mg/l 0.002 0.002

TOXICOLOGY OF SOME ENVIRONMENTS

A4 1. HAZARDS OF POLLUTANTS

A4 TABLE 1–CAUSES OF POISONING

A4 TABLE 1–CAUSES OF POISONING

Type	Example
------	---------

A4.1.1 Foods	Sewage/Water, Meats, Offal, Sickness carriers
--------------	---

A4.1.2 Allergens	Water, Plants, Fungi, Aquatic fauna
------------------	-------------------------------------

A4.1.3 Micro-organisms	(a) Bacteria—small dose *, spreading rapidly e.g. Dysentery bacilli
------------------------	---

	(b) Bacteria—large dose *, grows on or in food e.g. Salmonella, Staphylococcus, Clostridium welchii and botulinum, Bacillus cereus, Vibrio parahaemolyticus
--	---

	(c) Viruses—small dose *
--	--------------------------

A4.1.4 Chemicals	Inorganic e.g. metals, synthetic e.g. pesticides, and Organic e.g. alkaloids
------------------	--

A4.1.5 Parasites	Trichinella, Taenia
------------------	---------------------

A4 2. DANGERS OF MICRO-ORGANISM

Bacteria are organisms of minute living cells, with characteristic varying shapes and visible only through a microscope. They are present everywhere. Most bacteria are harmless and even useful to man but a small proportion are harmful (see Tables 2 and 3). Given optimal conditions bacteria can divide into two every 10-30 minutes, and into million or billions within one day. Symptoms of bacterial illness are characterised by diarrhoea and abdominal pains, with or without vomiting.

A4 TABLE 2–BACTERIAL ILLNESSES

Micro-organism	Effect	Incubation Period (hrs)	Duration	Death (days)
Bacillus cereus				
Clostridium welchii				
Clostridium botulinum			Toxin in food	
	Toxin in intestine			
	Toxin in food	2-15		

8-22

24-72 1-2

$\frac{1}{2}$ -1

Death in 1-2 months or slow convalescence over 4-6 months

Escherichia coli

Salmonella

Staphylococcus

Streptococcus Infection

Infection

Toxin in food

Toxin in food 4-36

12-36

2-6

3-12 1-7

1-7

A4 3 – RESERVOIRS AND TRANSMISSION OF HARMFUL BACTERIA

Any pathogenic micro-organism including viruses living in or passing through the intestinal tract may be transmissible by untreated water which is polluted by raw or even inadequately treated sewage. In order to cause an illness the water must be grossly polluted. That is why sewage should be well-treated before being discharged into or near a water body.

A4 TABLE 3 – RESERVOIRS AND TRANSMISSION OF HARMFUL BACTERIA

Man or Beast

Nose/Skin Lesion Staphylococci

Bowels Staphylococci

Hands Sewage/Water, Meats, Offal, Sickness carriers

Food and food poisoning Salmonella, Dysentery bacilli, Cl. welchii multiply in warm kitchen

A4 4 – DANGERS OF ECONOMIC POISONS

There are nowadays several economic poisons, including pesticides, which often cause poisoning and death to man and beast by the pesticides themselves, their raw materials, their containers and effluent, etc., being dumped into or near bodies of water. The toxicity of a chemical is expressed by means of an LD value, which is a statistical estimate of the dosage necessary to kill 50 percent of a large population of the test species, under stated conditions (see Table 4).

The organic phosphorus as well as carbonate poisons act as more or less irreversible inhibitors if the enzyme cholinesterase is present, and thus allow the accumulation of acetylcholine. Organochlorine pesticides and several rodenticides are also so deadly poisonous that both manufacturers, traders and users of pesticides should never be allowed to dump any pesticides or contaminated containers or effluent into or near a body of water.

A4 TABLE 4 – ACUTE ORAL AND DERMAL LD50 VALUES OF SOME ORGANOPHOSPHORUS PESTICIDES FOR WHITE RATS

Pesticide	Oral LD50 (mg/g.)		Dermal LD50 (mg/Kg.)	
	Males	Females	Males	Females

Carbophenothien	30	10	54	27
Clorthion	880	890	4,500	54,100
DDCP 80	56	107	75	
Delnav 43	23	235	63	
Demeton	2	2.5	14	8.2
Dias non	108	76	900	455
Dicaphtion	400	330	790	1,250
Dimethoate	215	–	400	–
Ethien 65	27	245	62	
Fenthion	215	245	330	330
Guthion	13	11	220x	220
Malathion	1,375	1,000	4,444	4,444
Methyl parathion	14	24	67	67
Methyl trithion	98	120	215	190
Parathion	13	3.6	21	6.8
Phorate	2.3	1.1	6.2	2.5

Phosdrin	6.1	3.7	4.7	4.2
Phosphamidon	23.5	23.5	143	107
TEPP	1.05	–	2.4	–
Trichlorfon	630	560	2000	2000

A4 TABLE 5 – ACUTE ORAL AND DERMAL LD50 VALUES FOR ORGANOCHLORINE PESTICIDES FOR WHITE RATS

Pesticide	Oral LD50 (mg/g.)		Dermal LD50 (mg/Kg.)	
	Males	Females	Males	Females
Aldrin	39	60	98	98
Chlordane	335	430	840	690
Chlorobenzilate		1,040	1,220	–
DDA	740	680	–	–
DDE	880	1,240	–	–
DDT	113	118	–	2,510
Dieldrin	46	46	90	60

Endrin	17.8	7.5	—	15	
Heptachlor	100	162	195	250	
Lindane (BHC)		88	91	1,000	900
Thiodan	43	18	130	74	
Toxaphene	90	80	1,075	780	

A4 TABLE 6 – TOXICITY OF OTHER PESTICIDES

Pesticide	Toxic Dose	Lethal Dose	Test Species	Other
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Rodenticides:

Phosphorus

Sodium fluoroacetate

15mg

0.5mg/kg

50mg

2mg/kg.

man

man

limit in air

-0.05mg/m³

Thallium	4mg/kg	—	—	limit in air
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-0.1mg/m³

Warfarin	1.7mg/kg	—	—	limit in air
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-0.1mg/m³

Fungicides:

Ferban	LD50mg/kg	-17,000	rats	—
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Zimram	LD50mg/kg	-1,400	—	—
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Maneb	LD50mg/kg	-7,500	—	—
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Zineb	LD50mg/kg	-5,200	—	—
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Nabam	LD50mg/kg	-395	—	—
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Organo-mercuries	30mg/kg	rats	limit in air
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-0.01mg/m3

Pentachlorophenols 2 percent

Na salt – – limit in air

-0.5mg/m3

Herbicides:

Arsenic compounds 50 mg. 128mg. man limit in air

-0.5mg/m3

Chlorophenoxy (2,4-D) – – – limit in air

-10mg/m3

Dinitrophenols LD50-10 LD50-30 – limit in air

-0.2mg/m3

A4 TABLE 7 – TOXICITY OF SOME METALS AND OTHER TOXICANTS

Toxicant	Toxic Dose	Lethal Dose	Test Supp.	Other
Arsenic	– 2mg/kg	man	max. in food - 3 µg/g; in water -	

0.05 mg/l

Asbestos

Cadmium 5mg/m³ 14mg/l

300mg/kg

rabbit

max in food - 0.2-30 ppm

Carbon monoxide – 4000 ppm man –

Formaldehyde – 800 ppm rat –

Hydrogen sulphide – 700 ppm man –

Lead – 5mg/100g man

(adult)

(bone) max in food - 0.2-30 ppm; in water - 0.1 ppm

Mercury 8mg/m³ – man –

Nitrogen oxide – 320 ppm mice in 1 hr.

Ozone 2 ppm – man in 2 hrs.

Sulphur dioxide – 50 ppm rabbit in 30 days

Iron 30mg/m³ — man max. in food - 250 ppm; water - 1.0 ppm

A4 TABLE 8 – HAZARDS OF IONISING RADIATION

All radiation exposure is harmful, and any unnecessary exposure to or dumping of wastes containing ionising radiation should be avoided. Ionising radiation can cause bodily harm (somatic hazards) to the individual who is exposed, or even genetic harm to his offspring. The pollution of water bodies by radioactive material is an increasingly serious problem, particularly where reactors are in operation, or where radioisotopes are used, e.g. treatment of malignancies by radium or cobalt in hospitals or in studies of sea pollution by effluent using radio-isotope tracers. Nuclear weapon tests also pollute the atmosphere and some environments by their "fall-out". Use of radioactive material is subject to some supervision by agencies supplying it and other internal and international bodies.