



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF HEALTH, APPLIED SCIENCE AND NATURAL RESOURCES**

**DEPARTMENT AGRICULTURE AND NATURAL RESOURCES SCIENCES**

<b>QUALIFICATION:</b> Bachelor Of Natural Resource Management Honours	
<b>QUALIFICATION CODE:</b> 08BNRMH	<b>LEVEL:</b> 8
<b>COURSE CODE:</b> IWWW821S	<b>COURSE:</b> Integrated Water and Wetland Management
<b>DATE:</b> JUNE 2022	<b>SESSION:</b> June
<b>DURATION:</b> 3 HOURS	<b>MARKS:</b> 120

<b>FIRST OPPORTUNITY EXAMINATION QUESTION PAPER</b>	
<b>EXAMINER(S):</b>	Ms. S. Bethune
<b>MODERATOR:</b>	Ms. N. Nashipili

<b>INSTRUCTIONS</b>
<ol style="list-style-type: none"><li>1. Answer ALL 6 questions, note choices.</li><li>2. Write clearly and neatly</li><li>3. Number the answers correctly.</li><li>4. Make sure your student number appears on the answering script</li></ol>

**PERMISSIBLE MATERIALS**

1. Examination paper.
2. Examination script.
3. Criteria for Identification of Wetlands of international importance

**THIS QUESTION PAPER CONSISTS OF 3 PAGES (Excluding this front page)**

## QUESTION 1. WATER AND WETLAND AWARENESS

- 1.1 You have been invited to give a presentation on the value of the Kuseb River as a linear oasis and the importance of groundwater in maintaining it, to a group of Grade 6 learners from De Duine School, visiting the Gobabeb Namib Research Institute. Based on what you know and experienced on your excursion to the lower Kuseb River Basin, prepare a suitable, **8 slide presentation** to show the ecological value of this ephemeral river to both wildlife and people who live alongside it. Clearly link your presentation to this year's theme for World Water Day and the environmental impacts that "mining" the aquifers can have, conclude with how they can motivate that their school, like the gardens in Walvis Bay, can make use of an unconventional water source to reduce this impact. Ensure that your presentation is well-illustrated and has a clear message for action. (16)
- 1.2 Based your excursion to the coast, prepare a short article (less than 250 words) for "*The Namib Times*" about what you learnt on your excursion regarding challenges of water supply to the coastal towns and the uranium mines, **and give** what you believe are **the best solutions** to these, in an area as arid as the central Namib. Provide a **caption** for and describe the photograph you will use to illustrate this. (8)

[24]

## QUESTION 2. WATER AND WETLANDS CONSERVATION - RAMSAR

- 2.1 Choose **either**: **A.** The Walvis Bay Wetlands Ramsar Site. (14)  
**or** **B.** The Iishana section of the Cuvelai system, a potential Ramsar site.  
Use the attached Ramsar Criteria to identify Wetlands of International Importance to write an **essay** motivating how the site you choose meets **5** Ramsar Criteria. (Do not simply give each criterion number, summarize each in your own words).

[14]

## QUESTION 3. NATIONAL-LEVEL, WATER RESOURCES MANAGEMENT

Based on your excursion to the coast, your discussions with Mr. Ignatius Shikongo and visit to Omdel Water Supply Scheme with Mr. Festus Kaurimuje of NamWater:

- 3.1 Name and give the correct abbreviation for the two River Basin Management Committees active in the Namib Water Region. (2)
- 3.2 List 5 responsibilities of Basin Management Committees. (5)
- 3.3 *Discuss 5 main challenges that the present KBMC committee faces.* (5)
- 3.4 List 2 lessons **you** learnt about River Basin Management from the roll-play you did. (2)
- 3.5 Clearly explain the difference between **equal** and **equitable** access to water resources. (2)

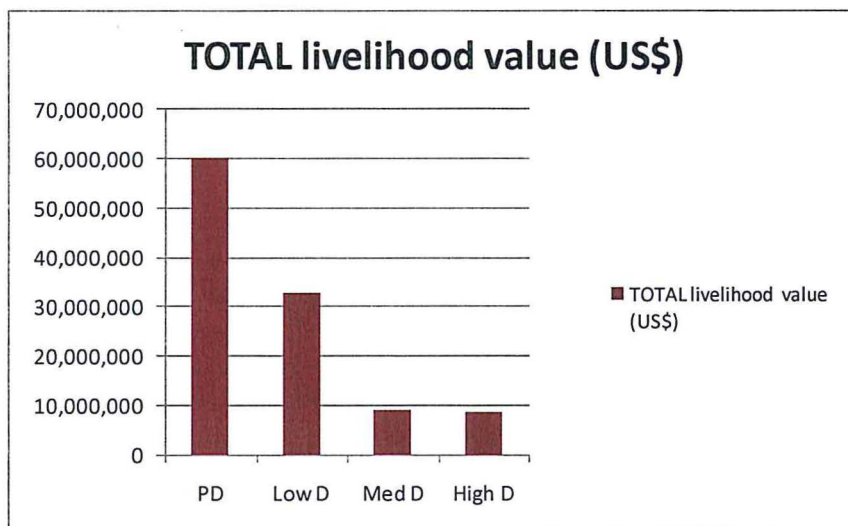
- 3.6 Based on your visit to the Omdel scheme and the lecture on water supply from ephemeral rivers with the Omaruru River as a case study, draw a simple sketch to show the layout of the scheme. Add short labels and arrows to explain the process. (8)

[24]

#### QUESTION 4. INTERNATIONAL- LEVEL RIVER BASIN MANAGEMENT

OKACOM undertook a Transboundary Diagnostic Analysis (TDA), including an Environmental Flows Assessment in all three basin countries sharing the Okavango River Basin, led by Dr Jackie King, who won the Stockholm Water Prize for her studies on Environmental flows. Based on what you have read and learnt about this Joint Okavango Environmental flows study, answer the following questions.

- 4.1 Explain the interactive approach taken for the Environmental Flows Assessment. (4)
- 4.2 Briefly outline the process that was followed to assess the impacts on environmental flows throughout the basin. (5)
- 4.3 What did the overall results of the environmental flows assessment of the Okavango River show and explain how this graph sums up the social impacts. Link your answer clearly to the three pillars of sustainable development. (5)



- 4.4 The Environment needs water too. Briefly discuss the two levels of **biomonitoring** that is done in all our Namibian perennial rivers to monitor water quality and so indicates river health. Say what it called, what it is based on, compare the method used by qualified scientists and the modified version used even by learners and communities. What advantage does this biomonitoring method have over conventional chemical monitoring of rivers? (10)

[24]



**QUESTION 5. WATER AND WETLAND RESOURCES MANAGEMENT, CONSERVATION AND CHALLENGES IN DIFFERENT NATIONAL RIVER BASINS**

Based on the National River Basins that you prepared your poster on, write a five-paragraph **essay** to discuss the water and wetland resources, their management, conservation, and the water challenges faced in the water basin **you** worked on. **16**

In your introduction give the location of the basin, the rainfall and typical vegetation of the basin. Then write 4 paragraphs, one each on: the water and wetland resources in the basin; water supply within the basin; the management of the basin at each appropriate level; finally discuss and give examples of the main challenges of waters supply and conservation of the water sources within your basin.

**[16]**

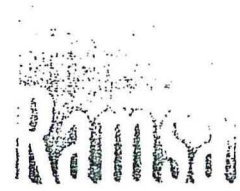
**QUESTION 6. INTEGRATED WATER RESOURCES MANAGEMENT (IWRM)**

6.1 IWRM is based on the principles agreed on at the International Conference on Water and the Environment held in Dublin, Ireland in January 1992. (10)  
List the Dublin Principles including the fifth Dublin Principle added in 2007/2008 **and** give an **example of how each** of the Dublin Principles is met in the water management in any Namibian river basin of your choice.

6.2 Discuss how linking unconventional water sources to the decreasing supplies from conventional water sources, could be the solution to managing the water supplies to the central coastal region. Base this on your visit to the Erongo desalination plant and your interviews held with NamWater officials during your coastal excursion. (8)

**[18]**

**TOTAL - 120**



# The Criteria for Identifying Wetlands of International Importance

## Group A. Sites containing representative, rare or unique wetland types

**Criterion 1:** A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

## Group B. Sites of international importance for conserving biological diversity

### Criteria based on species and ecological communities

**Criterion 2:** A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

**Criterion 3:** A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

**Criterion 4:** A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

### Specific criteria based on waterbirds

**Criterion 5:** A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

**Criterion 6:** A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

### Specific criteria based on fish

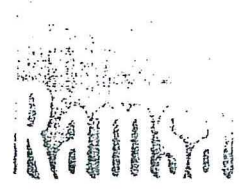
**Criterion 7:** A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.

**Criterion 8:** A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

### Specific criteria based on other taxa

**Criterion 9:** A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species.





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