

# NWFP Environmental Protection Agency

## Environmental Assessment Checklists and Guidelines

### Water Reservoirs in Arid Zones

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## 1. Introduction

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Pakistan is an arid country as most of the country falls in an arid zone where the annual rainfall is less than 1,000 mm. For most of the country the natural supply of freshwater is not assured in all seasons. To meet the growing water requirements, it is essential to manage the limited water supply in a way that it is available for domestic, industrial and irrigation purposes in all seasons and also in drought years when the rainfall is below the average level. Water

reservoirs are constructed for storage of storm water run-off and stream water.

### 1.1 Scope of Guidelines

These guidelines are applicable to all dams and reservoirs with a storage volume of less than five million cubic meters but more than one million cubic meter or surface area of less than one square kilometer but more than 0.2 square kilometer.

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## 1.2 How to use these Guidelines

The project proponent (the local government, municipal government, city government or the cantonment board) is obliged to use these guidelines. The project proponent has to fill in an environmental impact assessment form. The following steps are to be taken in this regard:

- Step 1: Provide information on project [use **Section I**]
- Step 2: Determine Applicability (*Are you sure that IEE or EIA is not required?*) [use **Section II**]
- Step 3: Describe the physical, biological and social environment [use **Section III**]
- Step 4: Assess potential impacts and applicable mitigation measures [use **Section IV**]
- Step 5: Provide undertaking to the EPA on mitigation measures and compliance [use **Section V**]

Completed form is to be submitted to the NWFP Environmental Protection Agency for evaluation. NWFP EPA may request for additional information or decide to undertake visit to the proposed project site in order to assess the environmental impact of the proposed project.

## 1.3 Glossary

**Act** means the Pakistan Environmental Protection Act, 1997

**Arid Zone** area receiving no rain or less rain

**Environment** means (a) air, water and land; (b) all layers of the atmosphere; (c) all organic and inorganic matter and living organisms; (d) the ecosystem and

ecological relationships; (e) buildings, structures, roads, facilities and works; (f) all social and economic conditions affecting community life; and (g) the inter-relationships between any of the factors in sub-clause (a) to (f).

**Environmental Assessment** a technique and a process by which information about the environmental effects of a project is collected, both by the developer and from other sources, and taken into account by the planning authority in forming their judgments on whether the development should go ahead.

**Habitat** the general place or physical environment in which a population lives  
**Hydrology** the branch of geology that studies water on the earth and in the atmosphere: its distribution and uses and conservation

**Impact on Environment** means any effect on land, water, air or any other component of the environment, as well as on wildlife harvesting, and includes any effect on the social and cultural environment or on heritage resources.

**Landslide** a slide of a large mass of dirt and rock down a mountain or cliff

**Mitigation Measure** means a measure for the control, reduction or elimination of an adverse impact of a development on the environment, including a restorative measure.

**Non-perennial Stream** stream not flowing throughout the year

**Regulations** means the Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environment Impact Assessment Regulations, 2000

**Siltation** accumulation of silt in a water body

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**Soil Erosion** physical removal of soil, either by wind or by running water

**Waterlogging** the rising of water table over time, and soaking of soils, in areas

where irrigated land is poorly drained. Waterlogging is often associated with salinization

## 2. Project Profile

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### 2.1 Description

Small water reservoirs are usually constructed by the provincial irrigation and power department, on the request of the communities. These dams are built on the non-perennial stream, mostly on a state lands with dam height ranging from 30 m to 40 m. Water stored in these dams is diverted through irrigation conveyance channels for extended irrigation.

The primary aims of these dams are:

- ▶ Flood mitigation
- ▶ Storage of water for domestic purposes
- ▶ Enhance groundwater recharge
- ▶ Storage of water for irrigation

### 2.2 Environmental Aspects

Depending on the size and location of the water reservoir various types of environmental issues may be associated with it. These are discussed below.

#### **Socioeconomic Impact**

- ▶ If private land is acquired for the dam or state land is used on which encroachments exist, compensation issues may arise if transparent and fair process is not used.

- ▶ Social conflicts may arise if dam is perceived to benefit one community more than the other or one community considers that the dam is having an adverse social or economic impact on them
- ▶ The reservoir can have adverse socioeconomic effect, for example, loss of vegetation species of economic or local medicinal significance, blockage of access, etc.
- ▶ With the rise in the water level in the reservoir, the water table in the surrounding areas also rises. This can result in beneficial, as well as negative impact depending on the rise. Excessive rise can result in water logging, lost of productivity of the land, and damage to structures. Whereas, if the increase is not drastic, the increase can actually benefit the landowners by providing irrigation water and increasing land productivity.
- ▶ Reservoirs can create an environment, which is favorable for the transmission of water-related diseases.

#### **Hydrological Impact**

- ▶ Environmental flows, that is, the amount of water that is needed in streams to meet the requirements of aquatic flora and fauna, need to be maintained. Insufficient water, or water at the wrong time, can result in a loss of habitat, breeding failure and even death for some species.

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- ▶ Silt deposits in the dam can alter the stream channel regime.

### **Safety Concerns**

- ▶ There is a potential safety risk to villagers and construction workers during the construction phase, particularly during dynamite blasting.
- ▶ Safety concerns that must be considered during the dam design includes over-topping of the dam, earthquake, seepage from the reservoir resulting in the failure of the dam, siltation beyond expected levels, and valley slope failure
- ▶ Rise in water table can also weaken soils and rocks that are otherwise stable when dry. This can result in landslip, therefore reducing the capacity of the dam. In more extreme cases, this can also result in the failure of the dam.

### **2.3 Mitigation Options**

The primary mitigation measure for most of the environmental and social issue is appropriate site selection. In addition, use of the following techniques will result in minimizing unacceptable social and environmental impact.

#### **Socioeconomic Impact**

- ▶ The land acquisition process should be transparent and fair
- ▶ The land should be priced at the prevalent market values
- ▶ In order to avoid community conflicts, to the extent possible, local labor should be used for unskilled, semi skilled and skilled jobs

- ▶ A formal resettlement plan should be prepared, if any resettlement is envisaged. The plan must identify the affected population as well as the affected activities such as agriculture, irrigation, forestry, commercial and industrial.
- ▶ It should be a key objective of the dam design to ensure that an appropriate share of the benefits go to the population directly affected
- ▶ All communities, upstream and downstream, should be fully consulted. The consultation process should be documented. The consultation process should also include village elders, local government and non-governmental organizations.
- ▶ All socioeconomic benefit and adverse impact of the reservoir should be documented and quantified and made publicly available.
- ▶ All possible uses of the area that will be inundated should be identified. Wherever needed, mitigation measures such as development of alternate routes, and provision of alternate sources of income should be introduced.
- ▶ While designing and siting the project, its likely impact on the surrounding water table should be determined. Any land or structure very close to the reservoir that is likely to be affected should be identified. To the extent possible the level of impact should be quantified and consent be obtained from the owner. If severe negative impact is expected, the land may be purchased and developed as public land.

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- ▶ Sanitation and health-care programs should be initiated for the population around the reservoir as a preventive measure for spread of water-related diseases
- ▶ As far as possible, the reservoir water level should be fluctuated to discourage growth of disease carrying insects.
- ▶ local government officials and community.
- ▶ A periodic and thorough review of the rainfall and runoff characteristics as well as the identification of other changes in the hydrology of the basin should be undertaken to monitor the changes in the hydrologic characteristics of the stream basin

**Hydrological Impact**

- ▶ Minimum flow required to maintain vegetation should be determined and it should be ensured that the flow is maintained
- ▶ Operational rules should be defined for regulating downstream flows at critical times to protect habitat for reproduction or migratory routes.
- ▶ Provisions for the migration of fish and other aquatic organisms should be provided, if needed

**Safety Concerns**

- ▶ The surrounding communities should be informed about the construction schedule and should be briefed about the safety procedures, particularly if dynamite is used for blasting rocks during construction.
- ▶ A comprehensive plan for operation, maintenance and rehabilitation should be prepared. This should include inspections, evaluations, modifications and upgrades of the dams to ensure that they meet safety standards.
- ▶ Emergency action plans should be prepared. Training should be provided to dam operators. Safety exercises should also involve the

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## Environmental Assessment Checklist

### Section I: Project Description

File No \_\_\_\_\_ (To be filled by EPA)

Date \_\_\_\_\_

#### General Information

1. Project Name or Title \_\_\_\_\_
2. Project Proponent (Department, organization, or owner) \_\_\_\_\_
3. Address \_\_\_\_\_
4. Telephone \_\_\_\_\_
5. Fax \_\_\_\_\_
6. E-mail \_\_\_\_\_
7. Representative of the Proponent \_\_\_\_\_
8. Designation \_\_\_\_\_
9. Name of the person who conducted this assessment \_\_\_\_\_
10. Designation \_\_\_\_\_
11. Qualification \_\_\_\_\_

#### Project Information

12. Project location \_\_\_\_\_
13. Cost of the project \_\_\_\_\_
14. Purpose of the reservoir \_\_\_\_\_
15. Name of the river or stream \_\_\_\_\_
16. Is the stream seasonal or perennial \_\_\_\_\_
17. Total area of the reservoir \_\_\_\_\_ m<sup>2</sup>
18. Total storage capacity \_\_\_\_\_ m<sup>3</sup>
19. Total volume of the embankment \_\_\_\_\_ m<sup>3</sup>
20. Brief Project Description \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*Please attach a map of the proposed project site showing the location of the key structures, access, etc.*

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21. Quantity of construction material (concrete, gravel, clay, etc.) required and their source: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Construction

22. Who owns the proposed land for the project? \_\_\_\_\_

23. What is the present use of the land? \_\_\_\_\_

24. Are there any structures on the proposed site now?  Yes  No

If yes, will any structure be demolished?  Yes  No

If yes, where the demolition waste will be disposed? \_\_\_\_\_

25. Are there any trees on the proposed site?  Yes  No

26. Will any tree be removed?  Yes  No

If yes, how many? \_\_\_\_\_

27. Period of construction (start and end dates) \_\_\_\_\_

28. What major construction equipment (dozer, grader, crane, etc.) will be used?  
\_\_\_\_\_

29. Will any land be acquired? \_\_\_\_\_

If yes, please specify

The total area: \_\_\_\_\_

Present ownership of land \_\_\_\_\_

What is the present use of the land? \_\_\_\_\_

How the land will be acquired (Through Land Acquisition Act or Direct Purchase)? \_\_\_\_\_

When the compensation will be paid? \_\_\_\_\_

30. In case of state land, are there any squatter settlements on the land? \_\_\_\_\_

If yes, please specify

Number of settlements \_\_\_\_\_

Will any compensation be paid? \_\_\_\_\_

When the compensation will be paid? \_\_\_\_\_

## Section II: Screening

Is the proposed project or part of the project in an ecologically sensitive area?



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<b>Type</b> (Dug well, tube well, hand pump)	<b>Location</b> (Village, road, mohalla, etc. and distance from the site)	<b>Depth and Yield</b>	<b>Uses</b> (Drinking, agriculture, domestic, industrial, washing, livestock)

7. Based on the interview of the surrounding population or a wildlife expert, is any form of wildlife found on, or around the proposed site of the project?

Yes     No

If yes, please describe \_\_\_\_\_

8. Are there any existing trees or vegetation on the proposed site?

Yes     No

If yes, how many? \_\_\_\_\_

9. Are there any community forest, reserved forest or protected area within 2,000 m of the proposed site?

Yes     No

If yes, please describe? \_\_\_\_\_

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10. What is the present land use of the proposed dam site and its vicinity (roughly a radius of 500 m) of the proposed site?

	Residential (Thick, Moderate, Sparse)	Commercial (Office, Shops, Fuel Stations)	Open Land (Parks, Farmlands, unutilized plots, barren land)	Industrial	Other
Description					

*(Please attach a map of the proposed project site and indicate roughly the area that you have considered for this evaluation)*

11. For any agricultural farmland on the proposed site and a radius of 500 m around it, provide the following information:

Main crop(s) and average yield \_\_\_\_\_

Source of irrigation water \_\_\_\_\_

Area affected by salinity or water logging \_\_\_\_\_

12. Please describe all the sensitive receptors within 500 m of the proposed site:

Type (schools, colleges, hospitals, and clinics)	Name	Size (Number of students or number of beds)	Location (Village, road, mohalla, etc.)	Distance from Site

13. What is the total population of the area? \_\_\_\_\_

14. What proportion of the houses in the area are *pukka*, *semi-pukka*, and *kutchra*? \_\_\_\_\_

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15. How are the general hygienic conditions of the project area?

- Generally clean
- Fair
- Poor

16. Is there any bad odor in the project area?

- Yes
- No

What is the source of the odor? \_\_\_\_\_

17. What are the main sources of income of the surrounding community? \_\_\_\_\_

18. Is there any site of cultural importance (graveyard, shrine, mosque, archeological site) within 1,000 m of the proposed scheme?

- Yes
- No

If yes, please describe? \_\_\_\_\_

19. Will the reservoir submerge any:

Village or house \_\_\_\_\_

Wetland \_\_\_\_\_

Forest \_\_\_\_\_

Sensitive vegetation \_\_\_\_\_

Wildlife habitat \_\_\_\_\_

Tomb or graveyard \_\_\_\_\_

Archeologically important site \_\_\_\_\_

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### Section IV: Impact Assessment

<i>Potential Negative Environmental Impacts</i>	<i>Tick, if relevant</i>	<i>Mitigation Measures</i>	<i>Tick, if proposed</i>	<i>Monitoring Plan</i>
Socioeconomic Impact	<input type="checkbox"/>	To the extent possible, local labor will be used for unskilled, semi skilled and skilled jobs	<input type="checkbox"/>	
		A formal resettlement plan will be prepared	<input type="checkbox"/>	
Water-related diseases	<input type="checkbox"/>	Sanitation and health-care programs will be initiated for the population around the reservoir	<input type="checkbox"/>	
		As far as possible, the reservoir water level will be fluctuated to discourage growth of disease carrying insects.	<input type="checkbox"/>	
Wildlife and vegetation	<input type="checkbox"/>	Minimum flow required to maintain vegetation will be determined and it will be ensured that the flow is maintained	<input type="checkbox"/>	
		Operational rules will be defined for regulating downstream flows at critical times to protect habitat for reproduction or migratory routes.	<input type="checkbox"/>	
		Provisions for the migration of fish and other aquatic organisms will be provided, if needed	<input type="checkbox"/>	
Safety Concerns	<input type="checkbox"/>	The surrounding communities will be informed about the construction schedule and will be briefed about the safety procedures	<input type="checkbox"/>	

*Continued...*

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<i>Potential Negative Environmental Impacts</i>	<i>Tick, if relevant</i>	<i>Mitigation Measures</i>	<i>Tick, if proposed</i>	<i>Monitoring Plan</i>
		A comprehensive plan for operation, maintenance and rehabilitation will be prepared. This should include inspections, evaluations, modifications and upgrades of the dams to ensure that they meet safety standards.	<input type="checkbox"/>	
		Emergency action plans will be prepared. Training will be provided to dam operators.	<input type="checkbox"/>	
		Safety exercises will also involve the local government officials and community.	<input type="checkbox"/>	
		A periodic and thorough review of the rainfall and runoff characteristics as well as the identification of other changes in the hydrology of the basin will be undertaken to monitor the changes in the hydrologic characteristics of the stream basin	<input type="checkbox"/>	
Risk of erosion and landslide	<input type="checkbox"/>	Stabilization measures will be undertaken	<input type="checkbox"/>	
Construction	<input type="checkbox"/>	Construction waste (excess rock and soil, demolition waste, etc.) will be disposed at _____ (location)	<input type="checkbox"/>	
		All properties, utility lines and other structures damaged during the construction will be restored	<input type="checkbox"/>	

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**Social Assessment**

***Socio-economic and Livelihood Impacts***

1. What are the existing social livelihood system and common property resource management system of the communities? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
2. Access to government facilities for health and education, and to drinking water \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
3. What are the pattern of existing conflicts, and existing mechanism of conflict resolution for areas under cultivation and grazing lands? Are there any potential conflicts between the upstream and down stream communities? \_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
4. What are the benefits perceived by communities of dams (please consult men and women separately) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
5. What role local institutions and communities will have in management and operation of the dam \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
6. Assessment of the potential conflicts between lower and upper riparian communities if any (history of conflicts in the area, claims on lands, disputes etc.) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
7. How was the process of consultation carried out, conducted and documented –with communities above and below the proposed dam site? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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8. Cultural and religious sites of community significance in the area to be submerged \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

***Gender Analysis and Impacts***

9. What level of consultation with men and women for the project was carried out? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

10. Who is the target (both direct and indirect) of the proposed project? Who will benefit? Who will lose? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

11. How marginalized communities will benefit by this project? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

12. Cultural, social and religious constrains to community participation (men and women) if any \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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**Section V: Undertaking**

I, \_\_\_\_\_ (*full name and address*) as proponent for \_\_\_\_\_ (*name, description and location of project*) do hereby solemnly affirm and declare:

1. The information on the proposed project and the environment provided in Forms I, II and III are correct to the best of my knowledge
2. I fully understand and accept the conditions contained in the Guidelines for \_\_\_\_\_ (*name, number and version of the guidelines*)
3. I undertake to design, construct and operate the project strictly in accordance with the project described in Form I, submitted with this undertaking.
4. I undertake to implement all mitigation measures and undertake monitoring stated in Form IV, submitted with this undertaking.

Date \_\_\_\_\_

Signature \_\_\_\_\_

Name \_\_\_\_\_

Designation \_\_\_\_\_

(with official stamp/seal)

Witnesses:

Signature

Name

Address

1

\_\_\_\_\_

2

\_\_\_\_\_