

**PAKISTAN
WATER AND POWER DEVELOPMENT AUTHORITY**

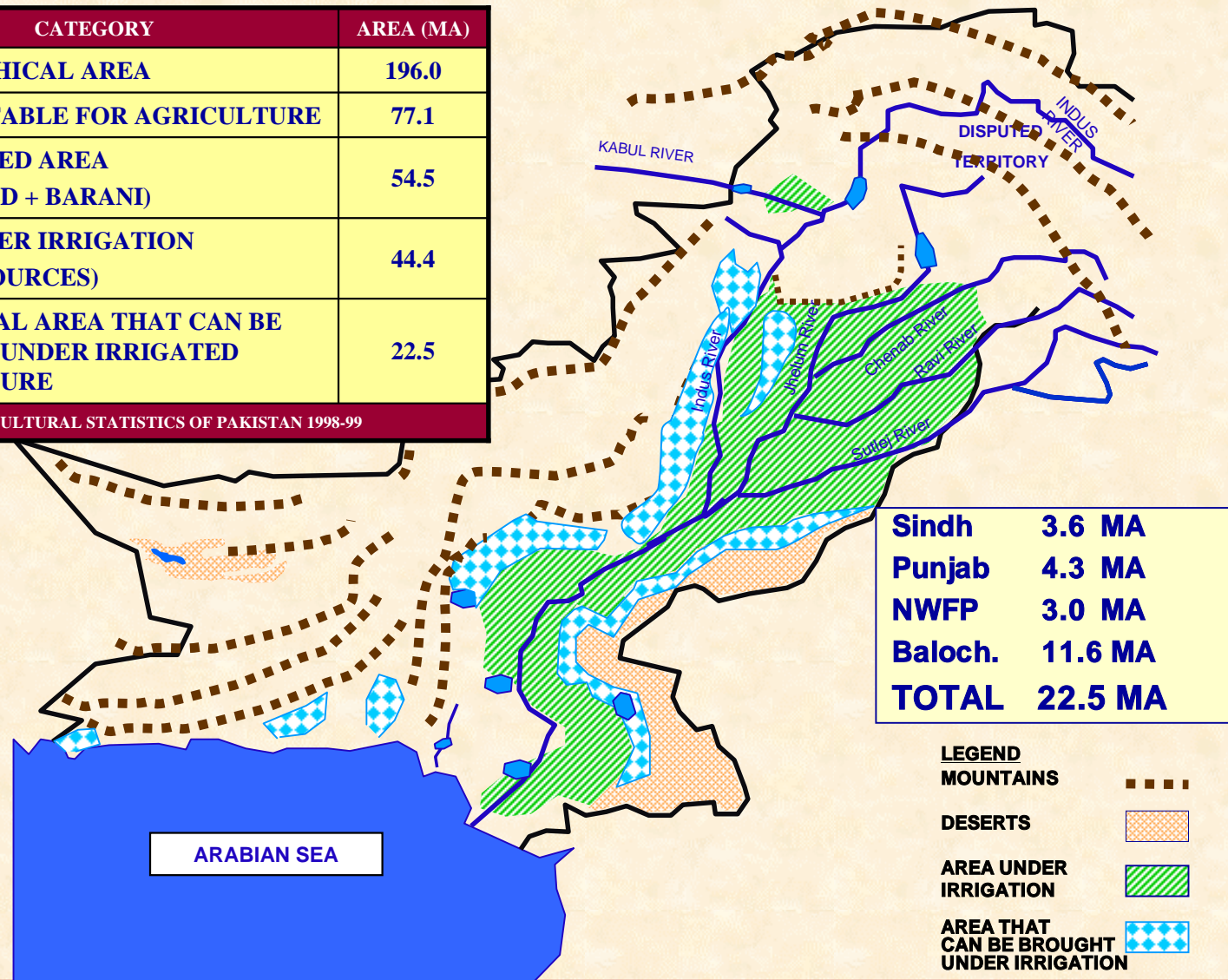


**INTEGRATED WATER RESOURCES MANAGEMENT
IN PAKISTAN**

LAND USE IN PAKISTAN


CATEGORY	AREA (MA)
GEOGRAPHICAL AREA	196.0
AREA SUITABLE FOR AGRICULTURE	77.1
CULTIVATED AREA (IRRIGATED + BARANI)	54.5
AREA UNDER IRRIGATION (BY ALL SOURCES)	44.4
ADDITIONAL AREA THAT CAN BE BROUGHT UNDER IRRIGATED AGRICULTURE	22.5

SOURCE: AGRICULTURAL STATISTICS OF PAKISTAN 1998-99



INTEGRATED WATER RESOURCES MANAGEMENT IN PAKISTAN

BACKGROUND

- **WATER RESOURCES** - MAINSTAY OF PAKISTAN ECONOMY
- **AGRICULTURE** - > 25% OF GDP
 - 44% OF LABOUR FORCE (75% POPULATION)
 - 65% OF FOREX EARNINGS.
- **PAKISTAN** - 80 MH (22 MH ARABLE) 
 - IRRIGATED AREA PRODUCES 95% OF AGRI. PRODUCTION
 - POPULATION:
 - (1998) 144 MILLION
 - (2025) 221 MILLION
- **WATER AVAILABILITY** - 83% OF POPULATION
 - 57% PIPED SUPPLY
 - URBAN MUNICIPAL + INDUSTRIAL SUPPLIES 5.3 BCM
 - BY 2025 – DOMESTIC SUPPLY 14.9 BCM
 - RURAL DRINKING WATER SUPPLY 53%
 - PER CAPITAL 1000 CUM/YEAR

SURFACE WATER RESOURCES

- ❑ SNOW & GLACIAL MELT AND RAINFALL
- ❑ INDUS BASIN 2/3 OF AREA
- ❑ TARBELA, MANGLA & CHASHMA RESERVOIRS
- ❑ 16 BARRAGES
- ❑ 12 INTER-RIVER LINK CANALS
- ❑ 2 SIPHONS
- ❑ 44 CANAL COMMANDS
- ❑ 61,000 KM IRRIGATION CANALS
- ❑ 107,000 KM WATERCOURSES
- ❑ GROSS IRRIGABLE AREA – 16.85 MH (14 Mh CCA)

- ❑ TOTAL SURFACE WATER – 190 BCM < 179 BCM (Western River)
11 BCM (Eastern River)
 - 129 BCM – DIVERTED FOR IRRIGATION
 - 50 BCM – TO SEA
 - 11 BCM – SYSTEM LOSSES

- ❑ AVERAGE INFLOW:
 - DURING SUMMER CROPS (APRIL – SEPT.) = 142 BCM
 - DURING WINTER CROPS (OCT. – MARCH) = 27 BCM
 - TOTAL DISSOLVED SOLUBLE IN UPPER REACHES = 100 – 200 PPM
 - TDS IN SOUTHERN REACHES. = 350 PPM

RAINFALL & FLOODS

RAINFALL

- **2/3 RAINFALL – JULY TO SEPTEMBER**
- **MEAN ANNUAL = 100 MM (LOWER IBS) TO 750 MM (UPPER IBS)**
- **SOURCES:**
 - **MONSOON (JULY – SEPT)**
 - **WESTERLY DISTURBANCES**
 - **TOTAL CONTRIBUTION IN AGRI. SECTOR = 30 BCM**

FLOOD PERIOD

- **CONTRIBUTION TO AGRI. PURPOSES = 40 BCM**
- **HILL TORRENTS IN NWFP & BALOCHISTAN = 14 AREAS (NOT DEVELOPED)**
- **TOTAL POTENTIAL = 14 BCM OUT OF 23 BCM FOR DEVELOPMENT OF 2.5 MH WASTE LAND.**

GROUND WATER

❑ UNCONFINED AQUIFER IN IBS

16 MH OF SURFACE AREA

6 Mh 10 Mh
(Fresh) (Saline)

❑ SAFE GROUND WATER YIELDS

68 BCM

59 BCM 9 BCM
(Being Extracted) (Difficult to Exploit)

❑ TUBEWELLS = 10,000 NOS (1960)
= 500,000 NOS (2002) – DIESEL + ELECTRIC

❑ GROUND WATER QUALITY: SALINITY < 625 PPM (MAJOR RIVERS)
>1800 PPM (HIGH SALINE AREA)

FLUORIDE = 7 – 12 MG/L (S.PUNJAB)

ARSENIC = 50 µG/L (S. PUNJAB)

PROSPECTS FOR ARID/SEMI ARID AREAS

- RAINFALL** < 100 MM CONSTITUTE SOUTH
(Main Source) NWFP, PUNJAB, MAJOR AREA
BALOCHISTAN & SINDH
- RAIN HARVESTING - KEY TO DEVELOPMENT**
- CHINESE EXPERIENCES MAY BE UTILIZED
- LOCAL DEVELOPMENT OF WATER RESOURCES IMPERATIVE**
- RECENT EXPERIENCES INVOLVING COMMUNITIES IN
DEVELOPMENT & MANAGEMENT OFFER HOPES.**
- ROLE OF WOMEN IN WATER MANAGEMENT**
 - CULTURAL & SOCIAL PRACTICES
 - RECENT PROJECTS SUPPORTED BY UNDP IN PAKISTAN.
 - INSPIRE MORE EFFORTS TO INVOLVE WOMEN IN MANAGEMENT OF
LAND AND WR
- NATIONAL WATER POLICY**
 - UNDER FINAL STAGES OF APPROVAL BY GOP
 - A LOT OF WORK NEEDED TO RAISE AWARENES BY INVOLVING
STAKE HOLDERS IN DECISION MAKING

MAJOR CHALLENGES

- ❑ **LOSS OF STORAGE CAPACITY DUE TO SEDIMENTS/PER CAPITA AVAILABILITY**
 - 1950: POPULATION 50 MILLION: FOOD IMPORTS UNDER PL 480 PROGRAM
 - TODAY: POPULATION 150 MILLION: SELF-SUFFICIENT
 - FUTURE (2025): POPULATION 221 MILLION @ 2.8%/YEAR : WATER SHORTAGES
 - URBAN POPULATION: 35% TO 52%
 - WATER AVAILABILITY/CAPITA LIKELY REDUCE TO < 600 CM BELOW THRESHOLD OF CHRONIC WATER STRESS IMPOSING MAJOR CONSTRAINT FOR ECONOMY.
- ❑ **WATER REQUIREMENT IN 2025 FOR IRRIGATION = 250 BCM ~185 BCM IN 2025**
 - BY EXPLOITING GROUND WATER AVAILABILITY = 190 BCM
 - SHORTFALL BY 2025 = 32% RESULTING FOOD SHORTAGES AFFECTING NATIONAL ECONOMY & LIFE STANDARDS.
- ❑ **WATERLOGGING AND SALINITY:**
 - WATERTABLE RISE = SERIOUS PROBLEM IN SALINE GROUND WATER.
 - SCARP PROGRAMME IN 1960 – 10000 TUBEWELLS (60 – 150/Ltrs/s)
 - ANNUAL PUMPAGE = 12 BCM (GREEN REVOLUTION IN 1970S).
 - LACK OF O&M FUNDING 13% OF IBS WATERTABLE 1.3 M DEPTH
 15% OF IBS WITHIN 3 M DEPTH.
- ❑ **SALT BUILDING IN SOILS**
 - AVERAGE SALT INFLOW IBS = 33 MT/YEAR
 OUTFLOW TO SEA = 16 MT/YEAR
 ANNUAL ADDITION IN BASIN = 17 MT/YEAR (MAIN SOURCE OF SALINIZATION)
 35 TO 40% OF IRRIGATED AREA AFFECTED BY SALINITY.

CONTD...

MAJOR CHALLENGES

.....2

- ❑ **SODICITY OF TUBEWELLS & OVER EXTRACTION**
 - 70% TUBEWELL PUMP SODIC WATER CONTAINING CO_3 & HCO_3
 - NO RESTRICTION ON CONTROL OF TUBEWELL INSTALLATION
 - GROUNDWATER EXTRACTION 80% IN PRIVATE SECTOR
 - CONTINUOUSLY LOWERING OF GROUNDWATER TABLE BECOMING INACCESSIBLE TO SMALL FARMERS.
- ❑ **LOW SYSTEM EFFICIENCY & CROP PRODUCTIVITY**
 - UNLINED CANALS & DISTRIBUTARIES – SEEPAGES.
 - DELIVERY EFFICIENCY 35 TO 40%
 - OVER IRRIGATION IN SOME PARTS OF COUNTRY
 - REDUCTION IN CROPS YIELDS:
 - WHEAT = 0.5 KG/M³ ~ 1.5 KG/M³ (USA)
 - MAIZE = 0.3 KG/M³ ~ 2.7 KG/M³ (ARGENTINA)
- ❑ **DROUGHT**
 - 2001
 - WORST YEAR - ECONOMIC GROWTH RATE 2.6%
 - LOSS OF US\$ 5 BILLION TO EXCHEQUER.
 - MASSIVE INTERNAL DISPLACEMENT WITHIN 15 YEARS IF DROUGHT PERSISTS.

THE WAY FORWARD

- ❑ **WATER EMERGING A VERY CRITICAL & ABUSED NATURAL SOURCE**
- ❑ **WASTE & OVER EXPLOITATION, POLLUTION & DEPLETION OF FRESH WATER POSE SERIOUS THREATS TO MANKIND**
- ❑ **UN REPORT – ONE BILLION PEOPLE TODAY UNDER WATER REGION – 3.5 BILLION IN 2025**
- ❑ **THEREFORE WATER SECTOR ISSUES NEED ADDRESSAL:**
 - **RECOGNIZE WATER HAS SOCIAL & ECONOMIC VALUE**
 - **RECOGNIZE THAT IT COSTS TO DELIVER WATER**
 - **RECOGNIZE WOMEN’S ROLE IN WATER MANAGEMENT**
- ❑ **TECHNICAL SOLUTION**
 - **IMPROVE WATER USE AND SYSTEM EFFICIENCY**
 - **MOVE TOWARDS SUSTAINABLE GROUNDWATER MANAGEMENT**
 - **IMPROVE IRRIGATION & CULTURAL PRACTICES**
 - **PROMOTE RAIN WATER HARVESTING/MANAGEMENT**
 - **PROMOTE USE OF WASTE WATER FOR AGRICULTURE**
 - **PROMOTE BIOLOGICAL APPROACHES FOR REHABILITATION OF SALINE LANDS.**
 - **INVOLVE STAKEHOLDERS IN WATER GOVERNANCE**

IMPLEMENTATION STATUS

□ VISION 2025 PROGRAMME

- **DEVELOPMENT OF 32 BCM OF STORAGES FOR THIRSTY LANDS**
- **DEVELOPMENT OF 13,000 MW OF HYDRO POWER PROJECTS**
- **SEVEN (7) WATER SECTOR PROJECTS UNDER IMPLEMENTATION STAGE**
- **EIGHT (8) WATER SECTOR PROJECTS UNDER FEASIBILITY STAGE**
- **THIRTY (30) PROJECTS UNDER APPRAISAL STAGE**
- **LINING OF CANALS AND DISTRIBUTARIES**
- **STAKEHOLDERS PARTICIPATION**
- **POVERTY ALLEVIATION PROJECTS IN BACKWARD AREAS**