



**Islamic Republic of Afghanistan**  
**Ministry of Agriculture, Irrigation and Livestock**  
**(MAIL)**



**Irrigation Directorate (ID)**  
**Capacity Development & Institutional Strengthening**  
**(CDIS) Project**

**Presentation**  
**on**  
**Geodatabase for Irrigation Systems in**  
**Afghanistan**

**Presented by: Eng. Abdullah Sharifi**  
**GIS Specialist**



**Kabul**  
**Tuesday, November 10, 2015**

# Presentation Outlines



## 1. Introduction

## 2. Irrigation Database

- ☐ Database Main Parts
- ☐ Irrigation Relevant Data
- ☐ Data Sources
- ☐ Methodology
- ☐ Data Formats/ Software Used
- ☐ Database Attribute Information

# Presentation Outlines Cont...



## 3. Application/ Utilization of Database

- ☐ Depiction of existing status
- ☐ Planning purposes
- ☐ Operation and maintenance
- ☐ Data sharing and collaboration

## 4. Challenges

## 5. Way Forward

# 1. Introduction



- CDIS (Capacity Development and Institutional Strengthening) is a capacity building project of the irrigation directorate (ID) funded by JICA.
- Development of the Geodatabase for Irrigation System is one of the CDIS tasks suggested by ID-MAIL.
- The database is expected to be useful to the management level for planning, implementation, monitoring and evaluation for the purpose of the irrigation development.

## Introduction Cont...



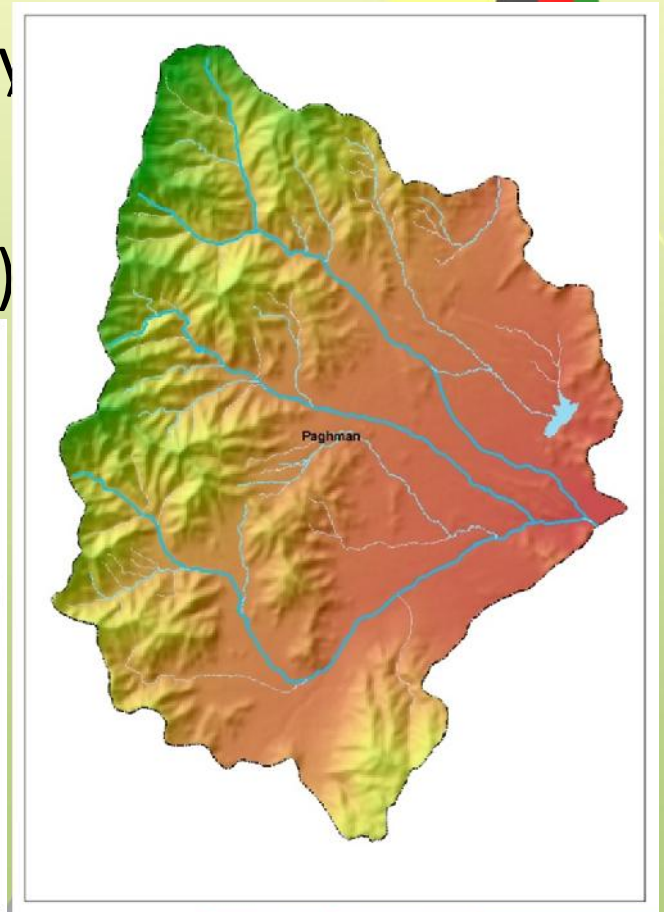
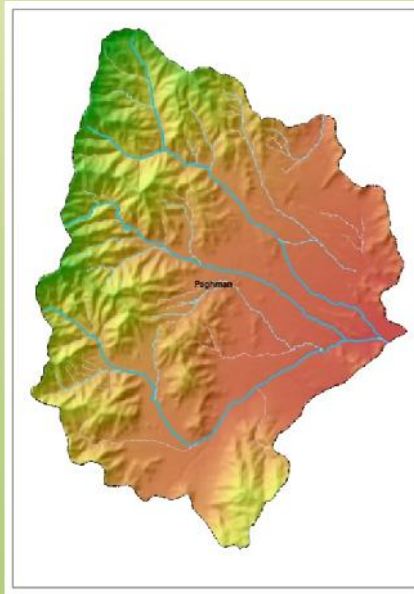
- Development of the database is ongoing process, currently CDIS is focusing on Kabul Province
- It is planned to collaborate it with the other relevant entities within MAIL.
- In the next phase, we are also planning to coordinate with other ministries like MEW and MRRD.

# Irrigation Database

**Database Main Parts:** Irrigation Database is consist of two main parts

## *1. Water Sources:*

- a) River Lines (Primary, Secondary Branches)
- b) Waterbodies (Lakes and Dams)

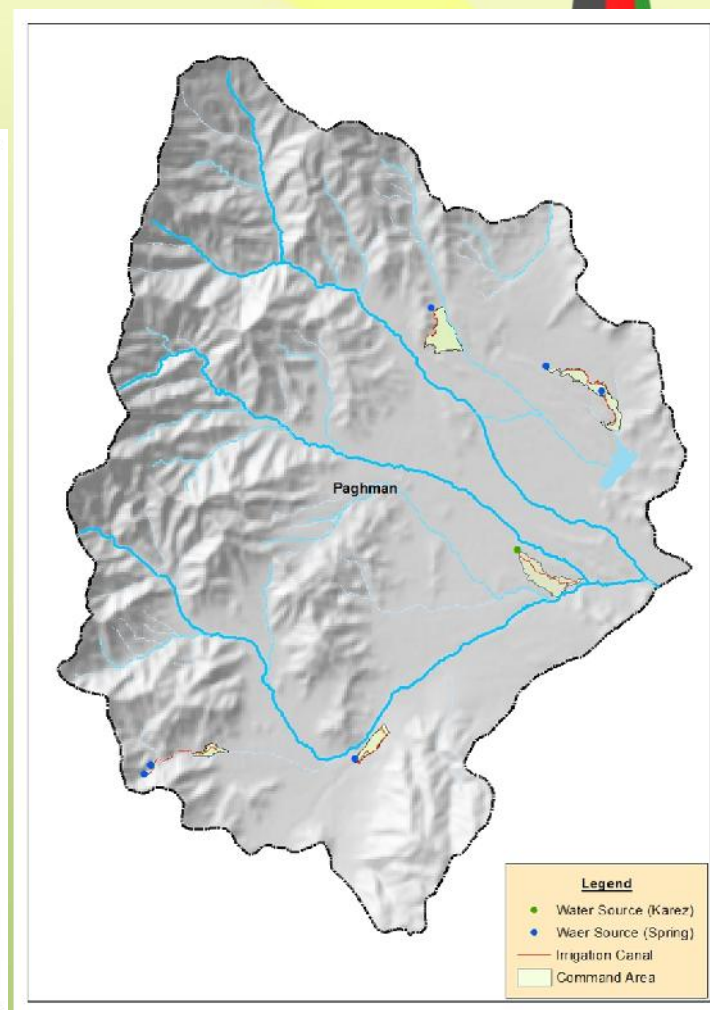
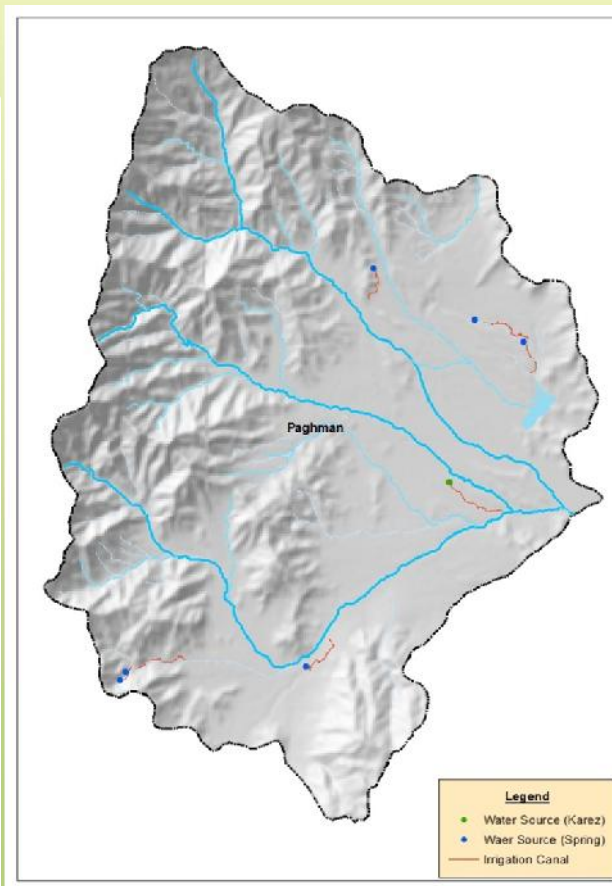
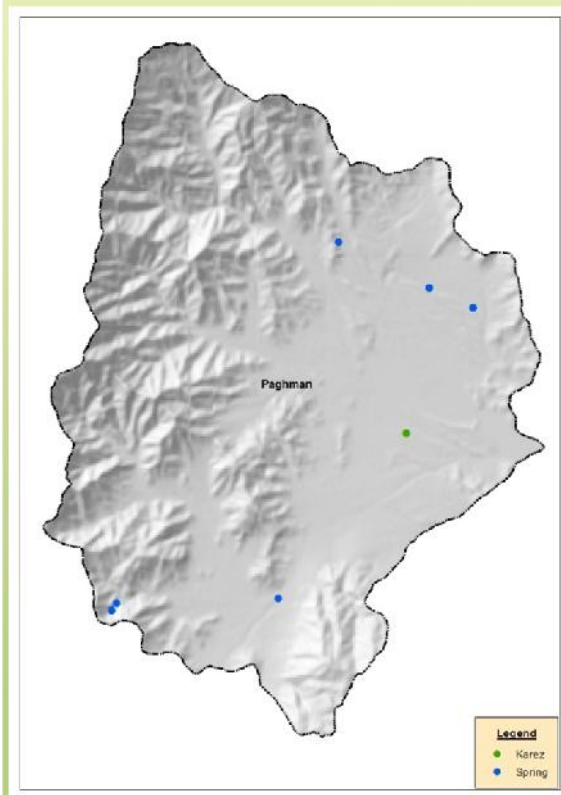




# Irrigation Database Cont...



## c) Water Source Points (Karezes, Springs, Tube Wells and Harrits)

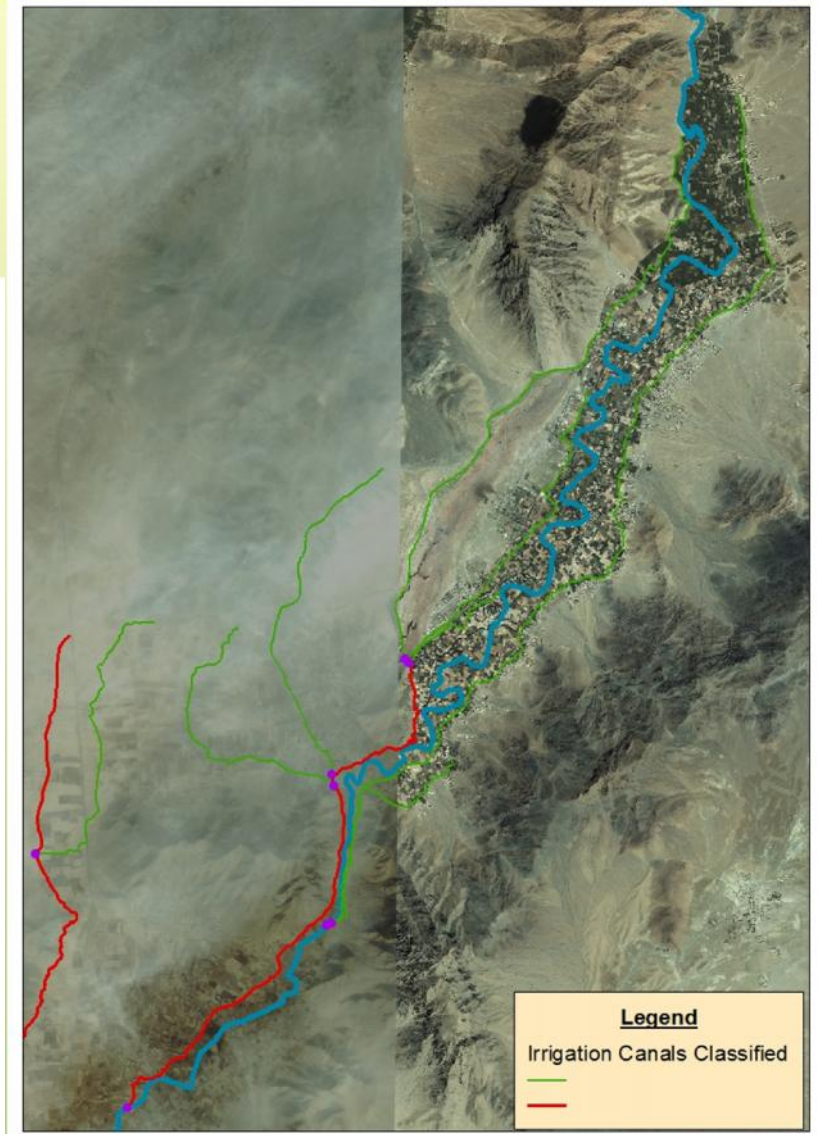
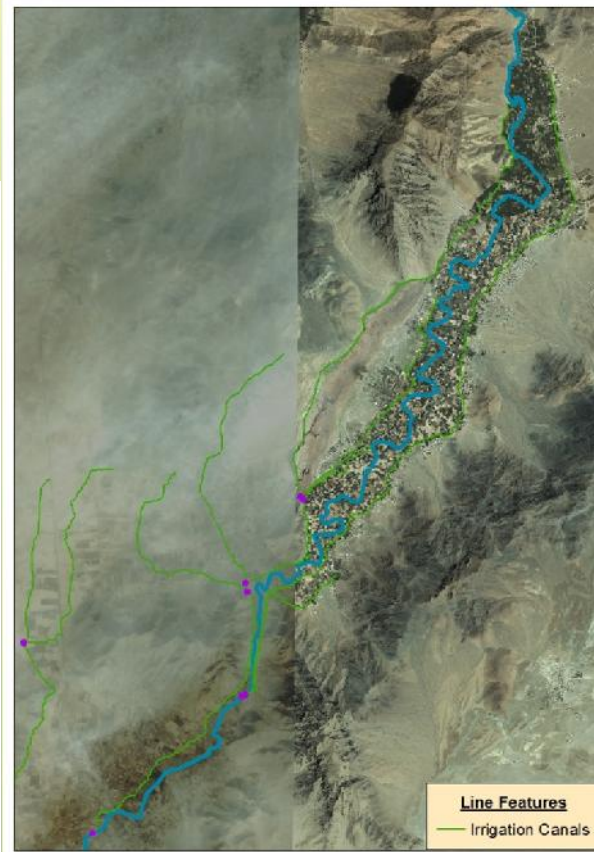


# Irrigation Database Cont...



## 2. Irrigation Systems

- a) Irrigation Intakes
- b) Irrigation Canals

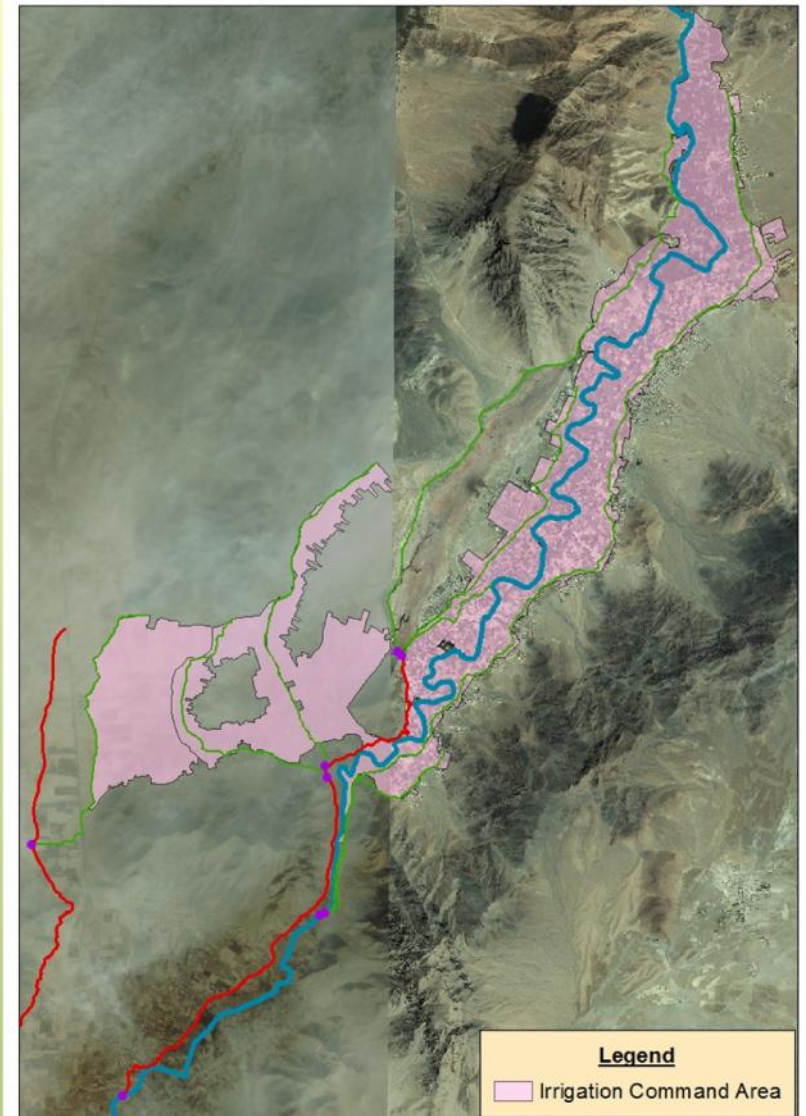




# Irrigation Database Cont...



- c) Irrigation Structures
- d) Irrigation Command Area



# Irrigation Database Cont...

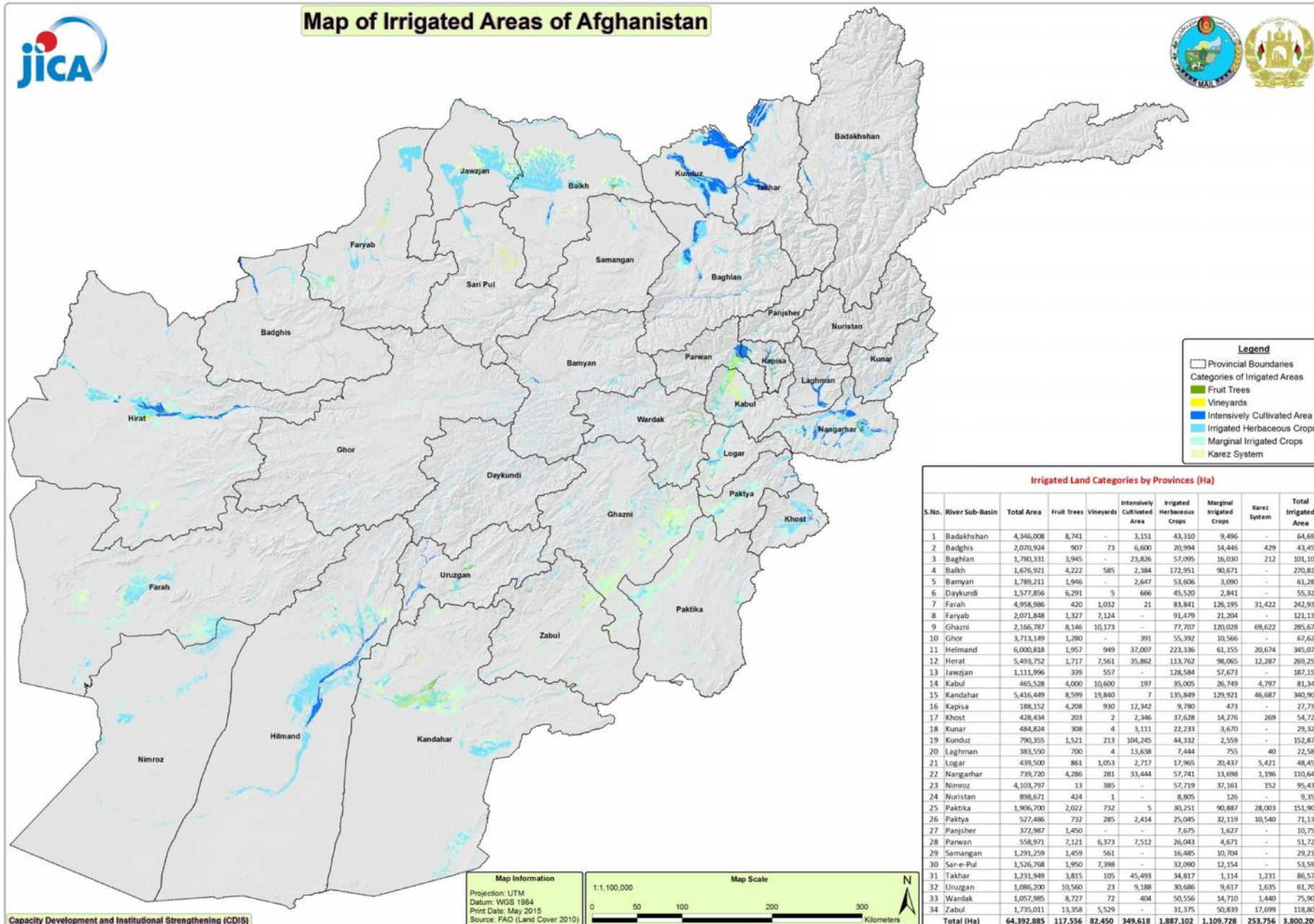


## **Irrigation Relevant Data:**

- Collection of all irrigation relevant data of Afghanistan in GIS format. It includes data like land cover classification, hydrological boundaries, irrigated area classes, climatic data, etc. collected from different sources



## Map of Irrigated Areas of Afghanistan



**Legend**

- Provincial Boundaries
- Categories of Irrigated Areas
- Fruit Trees
- Vineyards
- Intensively Cultivated Area
- Irrigated Herbaceous Crops
- Marginal Irrigated Crops
- Karez System

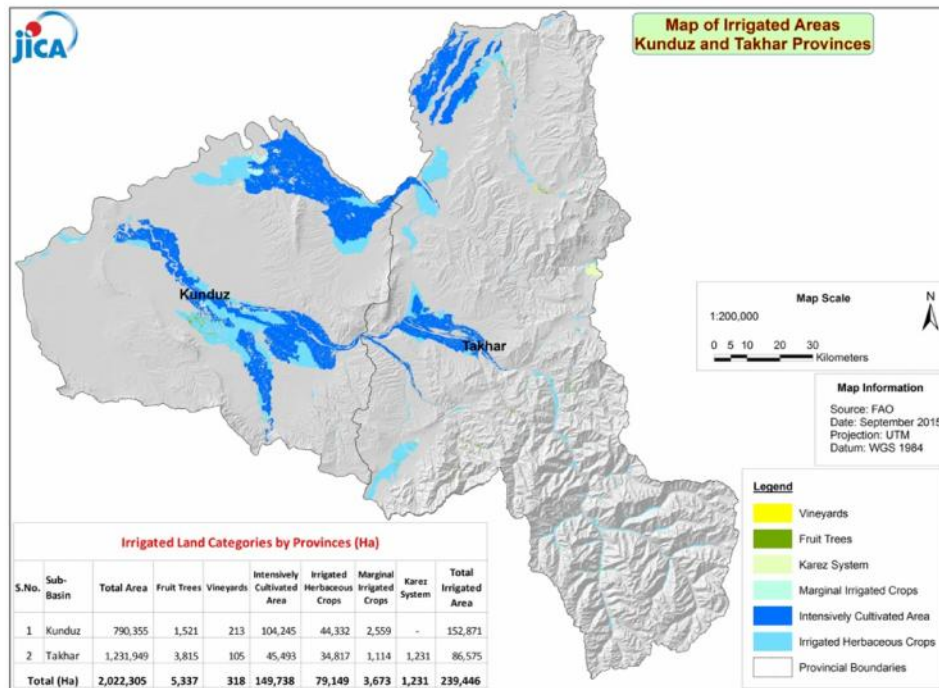
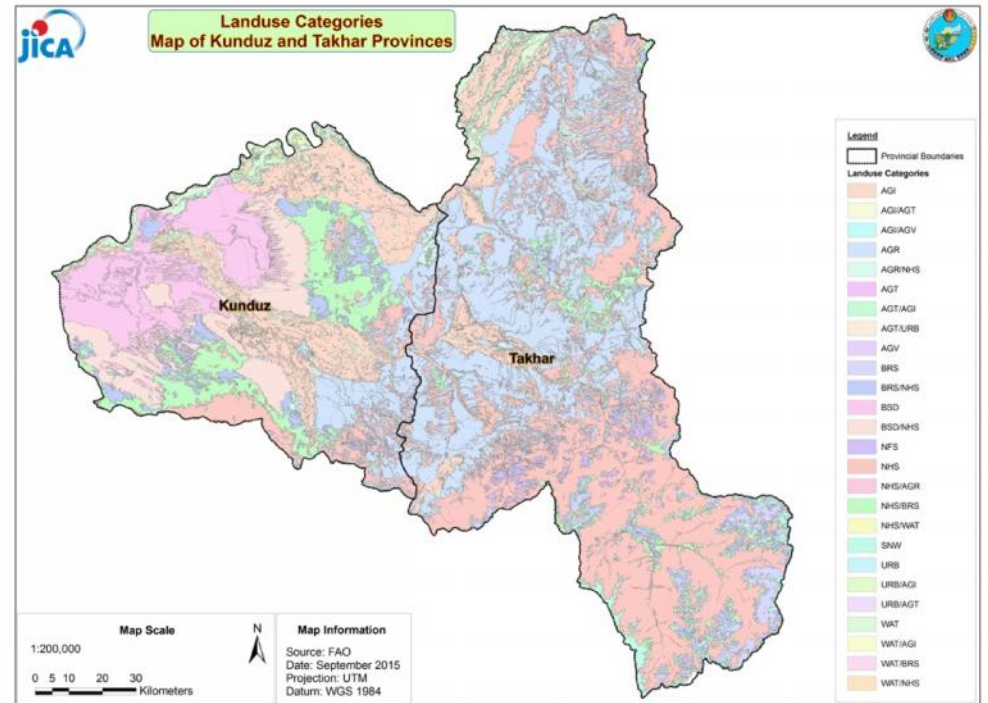
### Irrigated Land Categories by Provinces (Ha)

S.No.	River Sub-Basin	Total Area	Fruit Trees	Vineyards	Intensively Cultivated Area	Irrigated Herbaceous Crops	Marginal Irrigated Crops	Karez System	Total Irrigated Area
1	Badakhshan	4,346,008	8,741	-	3,151	43,310	9,496	-	64,698
2	Badghis	2,070,924	907	73	6,600	20,994	14,446	429	43,450
3	Baghlan	1,780,331	3,945	-	23,826	57,095	16,030	212	101,109
4	Balkh	1,676,921	4,222	585	2,384	172,951	90,671	-	270,813
5	Bamyan	1,789,211	1,946	-	2,647	53,606	3,090	-	61,289
6	Daykundi	1,577,856	6,291	5	666	45,520	2,841	-	55,322
7	Farah	4,958,986	420	1,032	21	83,841	126,195	31,422	242,931
8	Faryab	2,071,848	1,327	7,124	-	91,479	21,204	-	121,134
9	Ghazni	2,166,787	8,146	10,173	-	77,707	120,028	69,622	285,675
10	Ghor	3,713,149	1,280	-	391	55,392	10,566	-	67,629
11	Helmand	6,000,818	1,957	949	37,007	223,336	61,155	20,674	345,078
12	Herat	5,493,752	1,717	7,561	35,862	113,762	98,065	12,287	269,254
13	Jawzjan	1,111,996	339	557	-	128,584	57,673	-	187,154
14	Kabul	465,528	4,000	10,600	197	35,005	26,749	4,797	81,348
15	Kandahar	5,416,449	8,599	19,840	7	135,849	129,921	46,687	340,903
16	Kapisa	188,152	4,208	930	12,342	9,780	473	-	27,732
17	Khost	428,434	203	2	2,346	37,628	14,276	269	54,724
18	Kunar	484,824	308	4	3,111	22,233	3,670	-	29,325
19	Kunduz	790,355	1,521	213	104,245	44,332	2,559	-	152,871
20	Laghman	383,550	700	4	13,638	7,444	755	40	22,580
21	Logar	439,500	861	1,053	2,717	17,965	20,437	5,421	48,454
22	Nangarhar	739,720	4,286	281	33,444	57,741	13,688	1,196	110,646
23	Nimroz	4,103,797	13	385	-	57,719	37,161	152	95,490
24	Nuristan	898,671	424	1	-	8,805	126	-	9,356
25	Paktika	1,956,700	2,022	732	5	30,251	90,887	28,003	151,900
26	Paktya	327,486	732	285	2,434	25,045	32,119	10,540	71,136
27	Panjsher	322,987	1,450	-	-	7,675	1,627	-	10,752
28	Parwan	558,971	7,121	6,373	7,512	26,043	4,671	-	51,720
29	Samangan	1,291,259	1,459	561	-	16,485	10,704	-	29,210
30	Sar-e-Pul	1,526,768	1,950	2,398	-	32,090	12,154	-	53,593
31	Takhar	1,231,949	3,815	105	45,493	34,817	1,114	1,231	86,575
32	Uruzgan	1,086,200	10,560	23	9,188	30,686	9,617	1,675	61,709
33	Wardak	1,057,985	8,727	72	404	50,556	14,710	1,440	75,909
34	Zabul	1,735,011	13,358	5,529	-	31,375	50,839	17,099	118,800
Total (Ha)		64,392,885	117,556	82,450	349,618	1,887,102	1,109,728	253,756	3,800,209

**Map Information**  
Projection: UTM  
Datum: WGS 1984  
Print Date: May 2015  
Source: FAO (Land Cover 2010)

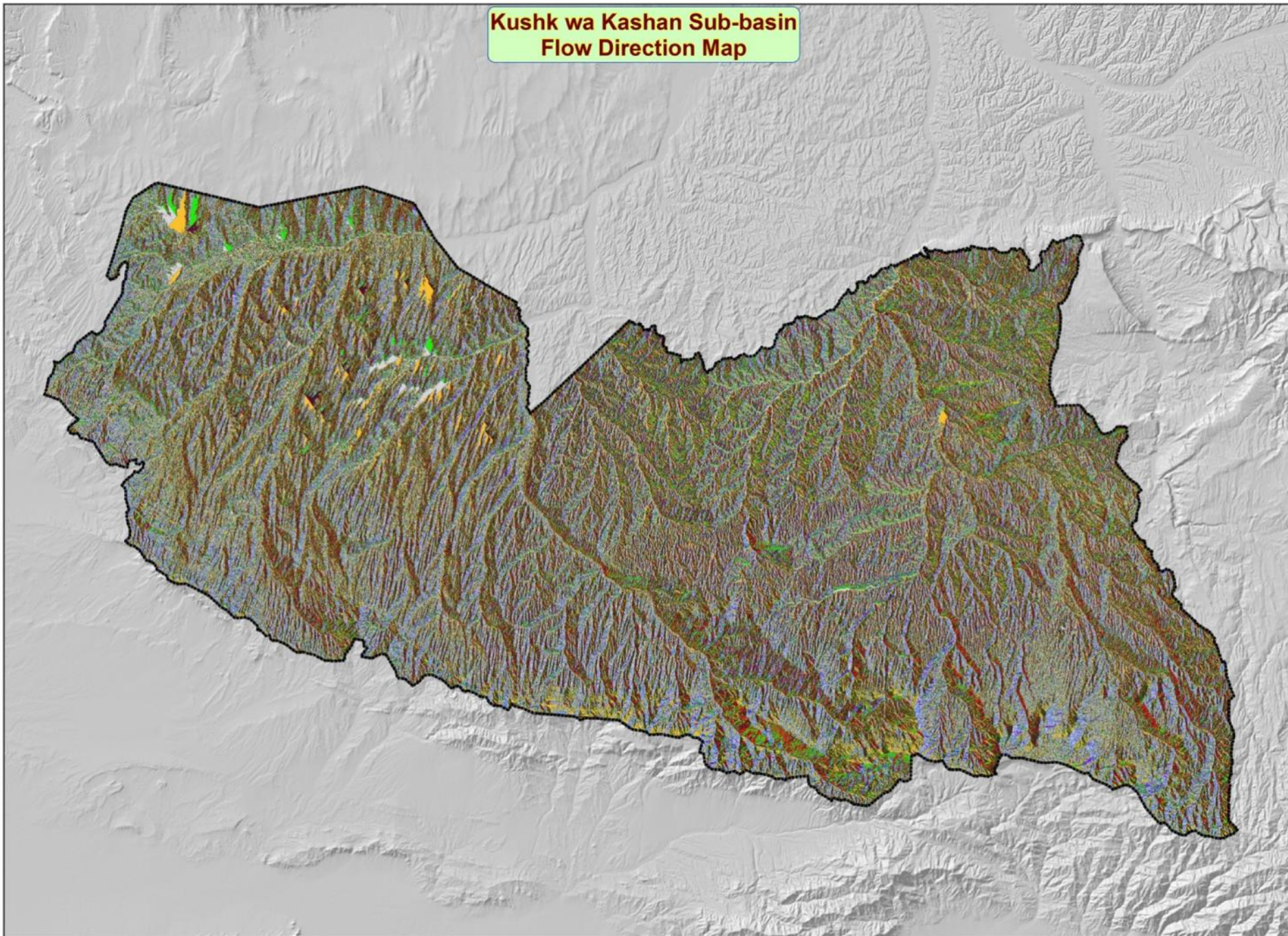






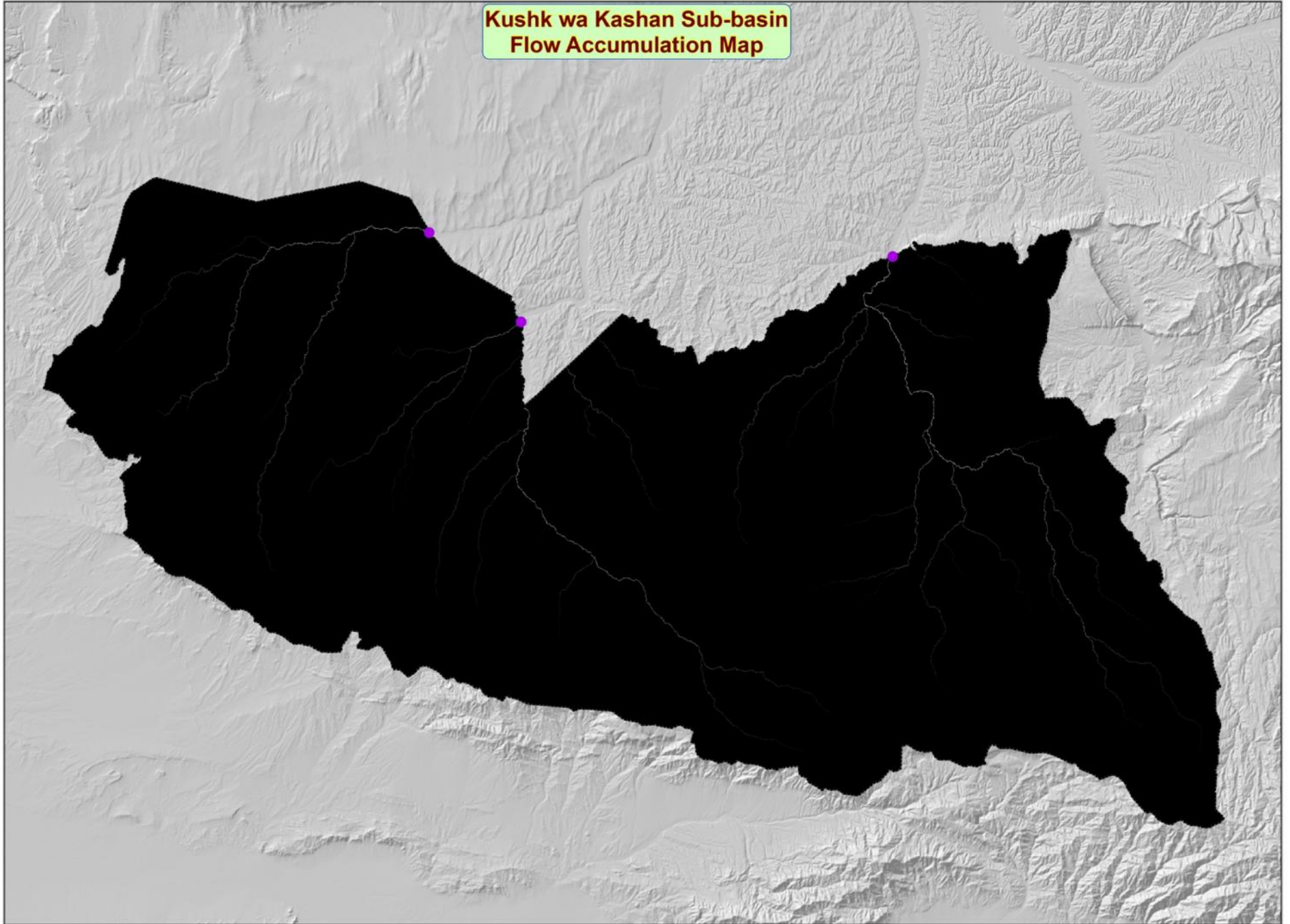


**Kushk wa Kashan Sub-basin  
Flow Direction Map**

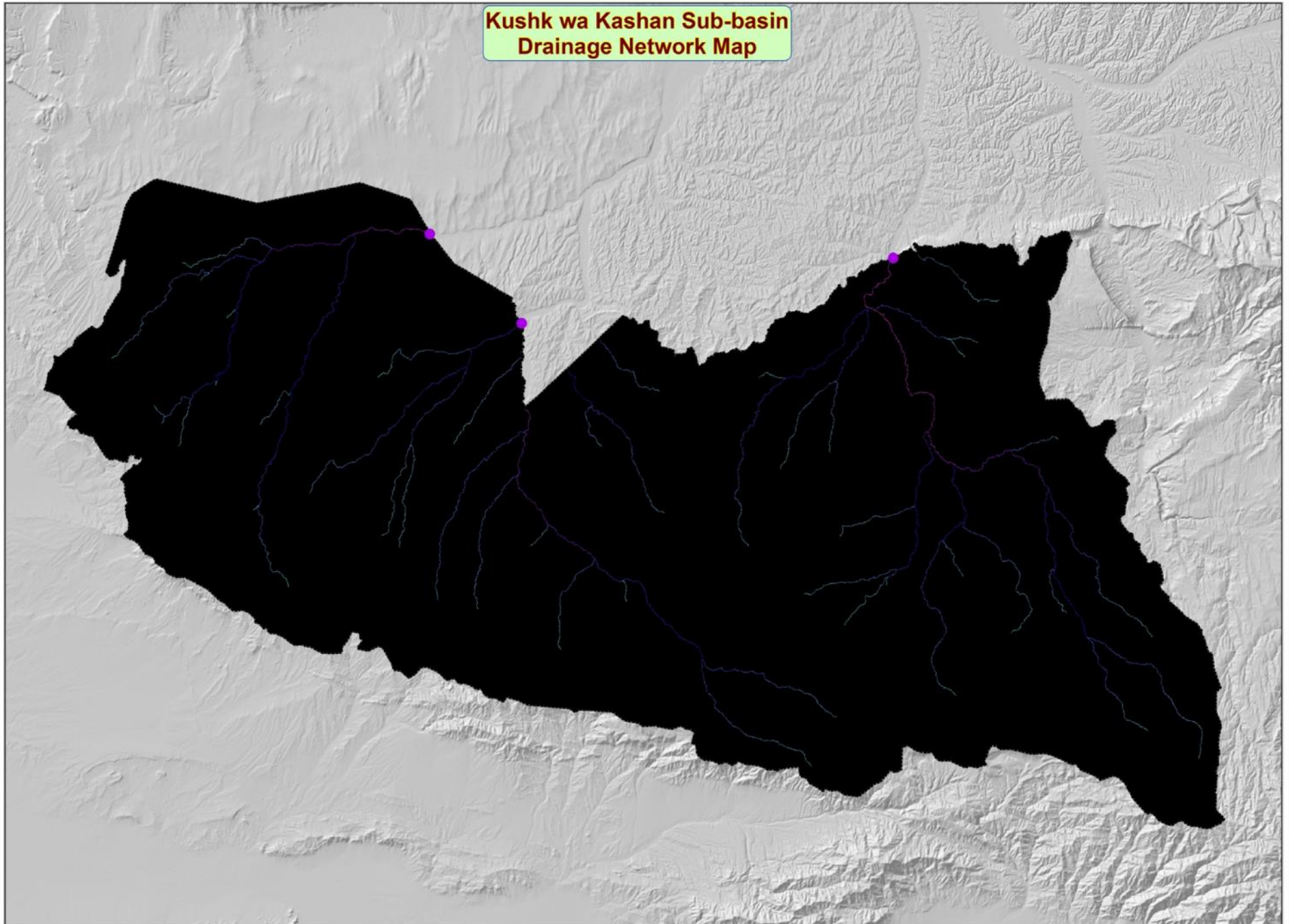




**Kushk wa Kashan Sub-basin  
Flow Accumulation Map**



**Kushk wa Kashan Sub-basin  
Drainage Network Map**



# Irrigation Database Cont...



## Data Sources:

The information for the irrigation database has been extracted using the following data sources:

- FAO Land Cover Map 2013
- DEM 10m Resolution (MAIL)
- DEM 25 m Resolution (USGS)
- Digital Imagery 1 m Resolution (MAIL)
- APE Raster Files (FAO)



# Irrigation Database Cont...



## Methodology:

- The irrigation database has been developed as follows
  - Kabul province has been selected for the pilot database
  - The existing irrigation systems have been identified using satellite imageries
  - The database model has been developed
  - Attribute relevant information have been extracted
  - The same database has been developed using ArcGIS Online (Web-based Technology) and Google Pro

# Irrigation Database Cont...

## Data formats used:

- Raster Formats: TIFF, MrSID, JPEG, GRID etc.
- Vector Formats: shape

## Software and applications used:

- a) ArcGIS Desktop 10.3
- b) Google Pro



# Irrigation Database Cont...

## c) ArcGIS Online (Web-based GIS)



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# Irrigation Database Cont...



## Database Attribute Information:

There are 3 types of spatial information to feed the attributes:

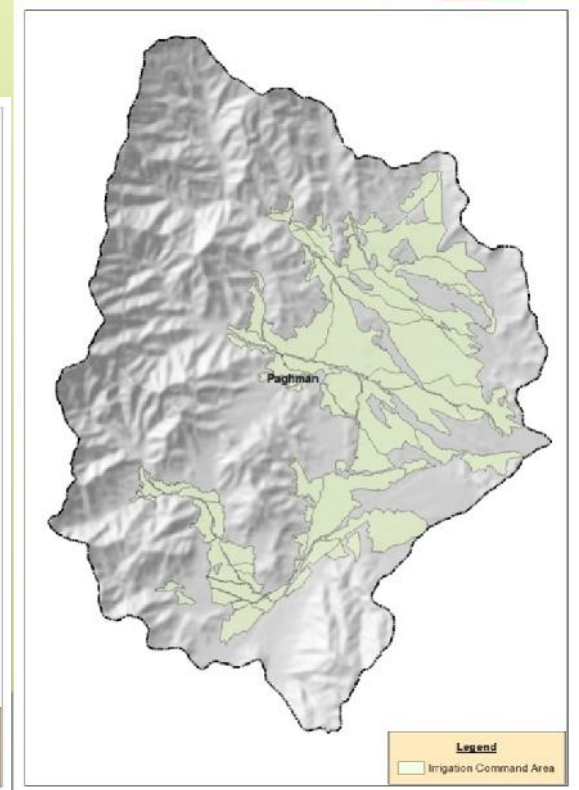
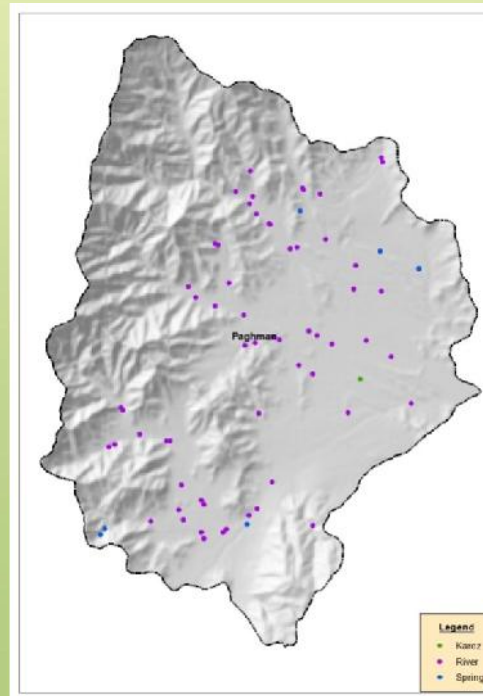
- Extracted from available data using GIS Applications
- Needed to be collected from secondary sources
- Need field investigations



## 2. Application/ Utilization of Database

### Depiction of Existing Status:

- To distinguish the different types of water sources and their location
- To depict the layout and location of the existing irrigation schemes



# Application/ Utilization of Database Cont...



## Depiction of Existing Status Cont...

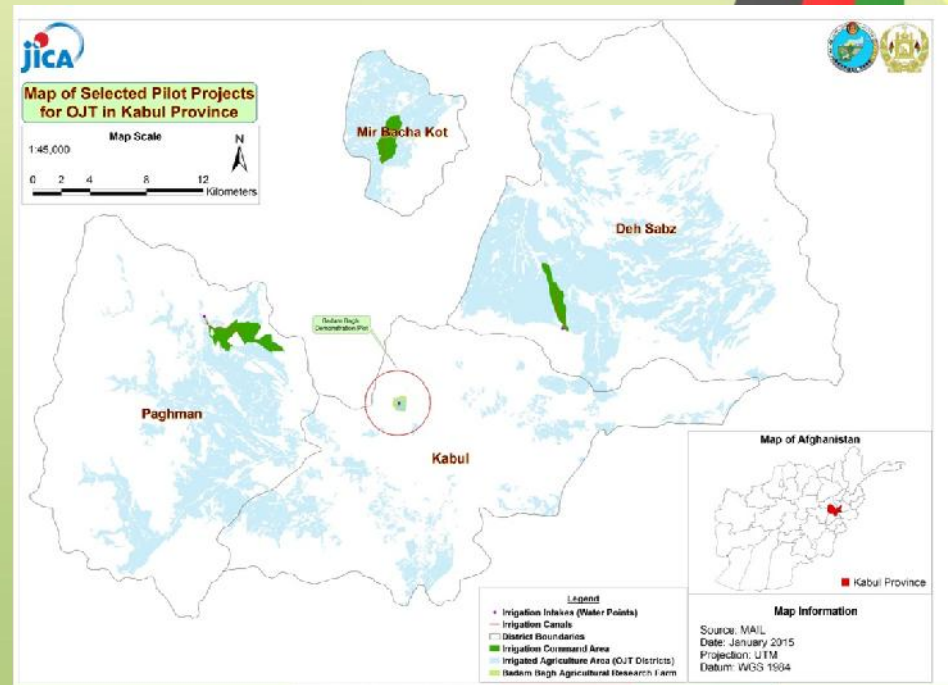
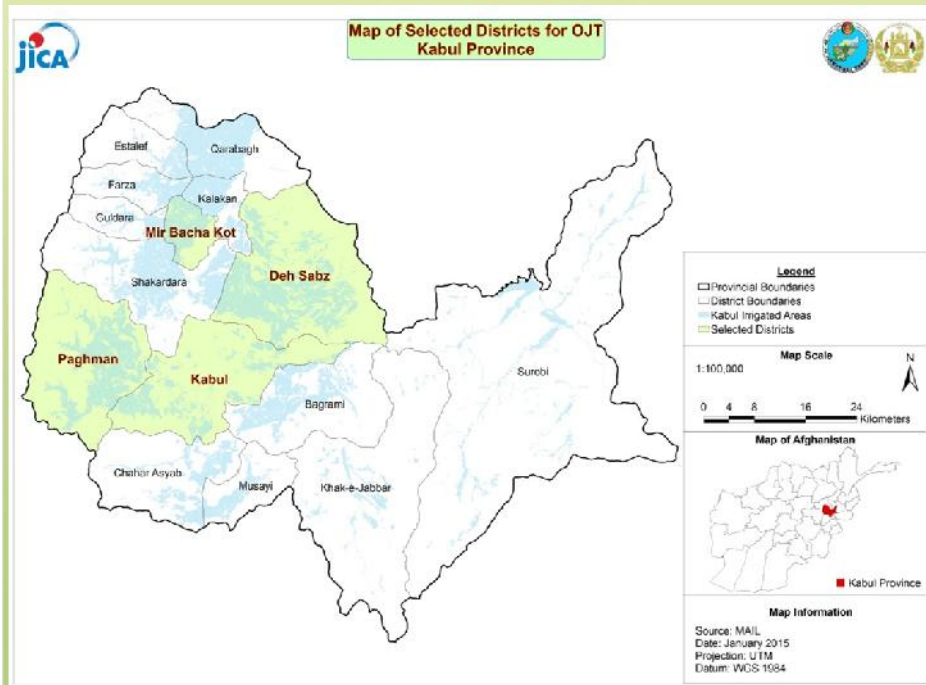
- To define the existing features of the irrigation systems
- To define the conditions of the infrastructure
- To have an accurate and up-to-date maps as when changes occur

# Application/ Utilization of Database Cont...



## Planning Purposes:

- To identify suitable areas for developing new irrigation schemes
- To prioritize the schemes based on certain criteria for the investment purposes



# Application/ Utilization of Database Cont...



## Planning Purposes Cont...

- To set the rehabilitation prioritization by identifying segments needing increased rehabilitation (capital improvement planning)
- Other implementation planning and decision making efforts



# Application/ Utilization of Database Cont...



## Operation and Maintenance Decision Making:

- To set the repair prioritization by identifying segments needing increased maintenance
- Asset management of irrigation infrastructure

# Application/ Utilization of Database Cont...



## Data Sharing and Collaboration:

- Check and test of the system in ArcGIS Desktop and then migrate to Irrigation Portal
- Development of GIS-based system to use a unique database on inter-ministerial level/ national level

# Application/ Utilization of Database Cont...



## Data Sharing and Collaboration Cont....:

- Web-based project collaboration and management dashboards
  - Mir Bacha Kot = <http://www.arcgis.com/home/webmap/viewer.html?webmap=121d50664e594764a5c0d82c998acfa3>
  - Deh Sabz = <http://www.arcgis.com/home/webmap/viewer.html?webmap=995121fc642b4c0b8af50e6625e51207>
  - Badam Bagh = <http://www.arcgis.com/home/webmap/viewer.html?webmap=b0082f6d1ac74887bef6cc1d4c8809b3>
  - Paghman = <http://www.arcgis.com/home/webmap/viewer.html?webmap=2a5d1c13d02240c395d53cdcf4e7f09>



### 3. Challenges

- Lack of data sharing
- Lack of coordination
- Lack of collaboration



## 4. Way Forward



- There should be a data sharing system under the supervision of SCoLW
- There should be regular GIS Users' meetings in order to avoid duplication in data extraction, etc.
- Arrangement of capacity building programs on Geo-informatics using the available capacity



مننه  
تشكر  
**Thank You**