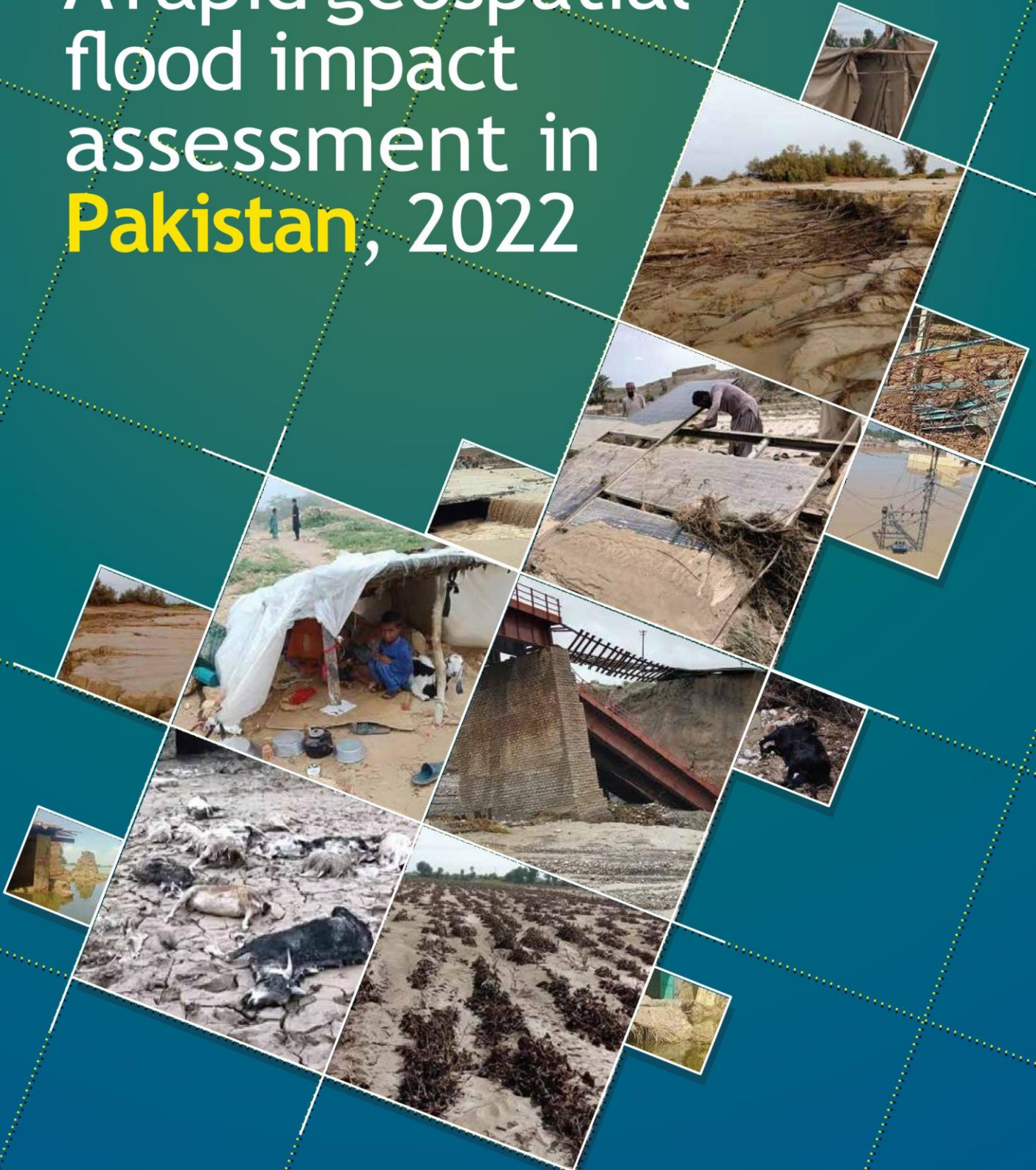




Food and Agriculture  
Organization of the  
United Nations

# A rapid geospatial flood impact assessment in **Pakistan**, 2022



# **A rapid geospatial flood impact assessment in Pakistan, 2022**

by

Fatima Mushtaq, Mehwish Ali, Amit Ghosh, Rashed Jalal, Areesha Asghar, Gautam Dadhich, Federica Chiozza, Gianluca Franceschini, Douglas Muchoney, Farrukh Toirov, Florence Rolle and Matieu Henry.

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# Executive summary

Pakistan is among the ten countries most affected by extreme weather events despite its very low carbon footprint, according to the Global Climate Risk Index 2021 and Climate Watch. Frequent natural disasters negatively impact the agricultural sector and household livelihoods, and push thousands of people into poverty and hunger.

In 2022, intense rainfall in monsoon season caused severe flooding across Pakistan and impacted a large number of people and households including deaths of people, damages of infrastructure (including roads, dams, buildings, electricity poles etc.), destruction of agricultural area and push millions of people into poverty and hunger. Since the beginning of the rainy season, it is reported that over 735 000 livestock have perished, and about 2 million acres of crops have been adversely impacted (UNCT, 2022).

In this context, the Food and Agriculture Organization of the United Nations (FAO) conducted a rapid geospatial impact assessment of floods on agricultural land, crop types and the exposure of people to floods during the period 1–31 August 2022. This assessment was conducted for four provinces of Pakistan (Punjab, Sindh, Khyber Pakhtunkhwa (KP) and Balochishtan) and provides information at both provincial and district levels. This assessment was also extended for the period 1-19 September 2022. In this report, additional results for flood extent for September 2022 were added while the core of the report and results focused on the most affected period i.e. August 2022. The methodological approach and results prepared for the period 1-19 September 2022 are consistent with the assessment for August 2022.

This analysis combines Sentinel 1 synthetic aperture radar (SAR) and Sentinel 2 at a 10 m spatial resolution, land cover 2021 data at 10 m spatial resolution and 2020 population data from WorldPop at 100 m spatial resolution to determine: (1) flood extent; (2) flooded agricultural area; (3) crop type area (rice, cotton, sugarcane, wheat); (4) flooded crop type area; and (5) exposure of people to flood extent for the period 1–31 August 2022. The results are provided in the form of maps by administrative units and tables with descriptive statistics for the aforementioned indicators. Because of limited available data, flood impact assessment on maize cultivation could not be calculated.

The key findings from this rapid assessment for August 2022 are that 1) almost 50 000 km<sup>2</sup> land area (6.3 percent of the total area) has been inundated; 2) almost 38 289 km<sup>2</sup> agriculture area (16 percent of the total agriculture area) including herbaceous crops irrigated, herbaceous crops rainfed, herbaceous crops in flood plain and tree orchards have been inundated; 3) about 1 002 km<sup>2</sup> sugarcane crop area, 7 611 km<sup>2</sup> potentially wheat crop cultivation area, 1 359 km<sup>2</sup> cotton crop area and 14 925 km<sup>2</sup> rice crop area have been impacted; 4) 580 km<sup>2</sup> forest area including trees sparse natural vegetation, tree forest plantations and trees dense natural vegetation have been inundated; and 5) almost 20 million people have been exposed to floods. Comparison between August and September 2022 revealed that flood has been receded from land area (44 000 km<sup>2</sup>) and from agricultural area (33 000 km<sup>2</sup>) in September 2022.

With recent advances in geospatial and information technologies and updated land cover maps, crop specific information adapted to national conditions with tailored field campaigns are expected to better support response programmes and agricultural development as well as to support emergency response programmes in the future.

# 1. Background

South Asia is one of the most flood prone regions in the world. Heavy precipitation during monsoon season frequently generates floods in the region, that can severely damage people, property, crops, and infrastructure (Mirza, 2011). The frequency of extreme floods is on the rise especially in Pakistan, Bangladesh and India. Moreover, in the recent years, impact of climate change has worsened the situation. There are more extreme weather events due to climate change including intense rainfall, glacier melting, rise in water level, floods, and others in the region.

Flooding is one of the leading causes of crop losses and agriculture infrastructure damage, greatly impacting the food security in both developed and developing countries (Brody, Highfield and Blessing, 2015; Rahman *et al.*, 2017). Due to the limitation of essential technologies and lack of resources for flood recovery, control, and mitigation, developing countries are more vulnerable to this hazard than developed countries (Kayaga *et al.*, 2020; Khan *et al.*, 2021; Veettil, Raghu and Ashok, 2021).



Since the beginning of the 2022 rainy season, Pakistan has experienced serious effects on its agricultural sector and the livelihoods of the population due extreme rainfall. It is reported that almost one-third of the country has been flooded, especially the most impacted provinces are Balochistan, Sindh, Punjab, and Khyber Pakhtunkhwa. Over 33 million people have been impacted. Considering the overstretched resources and ongoing humanitarian crisis in the country, humanitarian agencies urgently require technical support to assess the impacts of floods



to cover the unfolding needs in the country (OCHA, 2022; UNCT, 2022; UNHCR, 2022; WFP, 2022).

In this context, the Geospatial Unit at the Land and Water Division (NSL) of the Food and Agriculture Organization of the United Nations (FAO) has been actively providing support in collaboration with country offices, regional and national partners to assess the impacts of tropical storms (Mushtaq *et al.*, 2022) and natural disasters (Tattaris *et al.*, 2022) using innovative geospatial technologies.



The objectives of this rapid geospatial flood impact assessment, considering the limited time and information available, are to: (1) assess flood extent,<sup>1</sup> (2) identify flooded cropland,<sup>2</sup>

---

<sup>1</sup> Definition of flooded area: In FAO Geospatial analysis, flooded area is the total land area which is inundated by water.

<sup>2</sup> Definition of flooded cropland/inundated cropland: In FAO Geospatial analysis, affected cropland includes only submerged crop area that has been inundated by water.



(3) assess exposure of people to flood,<sup>3</sup> and (4) provide the results in support to regional, national, and local response actors to process and act. The constrained data availability, lack of access to field information, and short assessment period may limit the ability of the assessment to fully capture the damage resulting from the flood. However, it provides an initial reliable source of information to support recovery plans in agriculture sector.

Sentinel 1 (radar) imagery is used to analyze the flood extent in the area of interest (AOI) for the duration of 1 – 31 August 2022. In order to assess the post disaster assessment flood extent was also analyzed for the duration of 1 – 19 September 2022. Sentinel 2 (optical) imagery is also used to analyze the flood extent for August 2022. Detail is provided in Table 2.



Lasbela, Balochistan  
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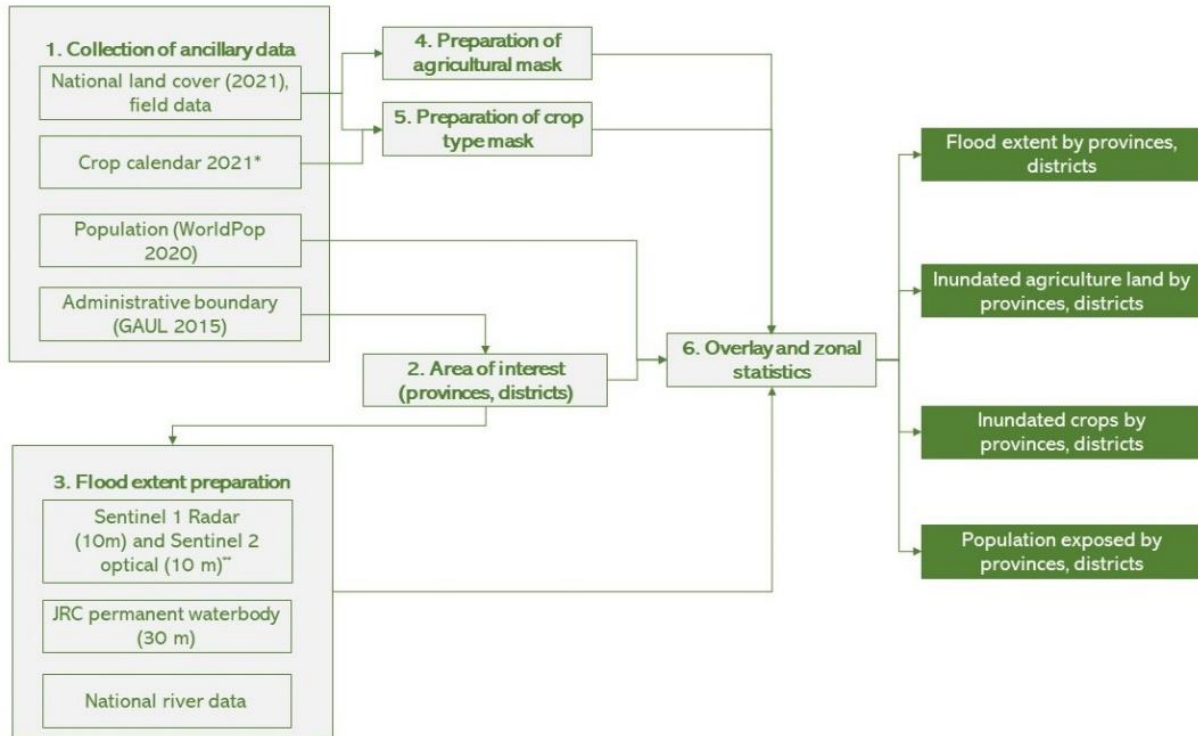
## 1.1. Methodological approach

The methodological steps presented in Figure 1 are taken to provide results for this rapid geospatial impact assessment for the AOI and are mentioned in detail below. For this assessment, flood extent using Sentinel 1 for August and September 2022 has been analyzed (Annex I and Annex IX). Impacted agricultural area has been analyzed by using Sentinel 1 for August 2022 (Section 2 and Annex II). Impacted and/or potentially impacted crop type and/or cropland has been analyzed by using Sentinel 1 for August 2022 (Section 3). A comparison of the flood extent in August and September 2022 is provided in Section 4. People exposure to flood is estimated

<sup>3</sup> Definition for affected people: Affected people means number of persons exposed or living close to the flooded areas by district according to FAO definition in the Geospatial Analysis.

using the flood extent and population data. For this flooded agricultural area was divided by the population layer to estimate the exposure to floods (per capita flooded agricultural land) (Section 2.6).

Figure 1. Methodological diagram for the rapid flood impact assessment in Pakistan for the period of 1-31 August 2022



Source: Author's(s) elaboration.

### Step 1: Collection of ancillary data

Ancillary data is identified and collected including administrative boundary at administrative level 2 and 3, agriculture mask using land cover 2021 prepared by FAO, crop calendar (Table 1), national river and water bodies data, and population data by WorldPop.

Table 1. Crop calendar for 2021 in Pakistan

| Crop calendar | Month | March | April | May | June | July | August | September | October | Nov |
|---------------|-------|-------|-------|-----|------|------|--------|-----------|---------|-----|
| Rice          |       |       |       |     |      |      |        |           |         |     |
| Sugarcane     |       |       |       |     |      |      |        |           |         |     |
| Cotton        |       |       |       |     |      |      |        |           |         |     |
| Wheat         |       |       |       |     |      |      |        |           |         |     |
| Sowing        |       |       |       |     |      |      |        |           |         |     |
| Harvesting    |       |       |       |     |      |      |        |           |         |     |
| Growth        |       |       |       |     |      |      |        |           |         |     |

Source: NAMC. 2022. *Crop calendar of Pakistan*. National Agromet Centre, Pakistan Meteorological Department.. <https://namc.pmd.gov.pk/crop-calendar.php>

## Step 2: Selection of area of interest

Area of Interest for this rapid assessment was selected based on the priority area for emergency response. It includes four provinces of Pakistan (administrative level 1) including Punjab, Sindh, Balochistan and Khyber Pakhtunkhwa. GAUL, WFP 2015 administrative boundaries is used at national, provincial and district level.

Table 2. Number of districts in the four provinces for this assessment

| ID    | Province name      | District administrative units |
|-------|--------------------|-------------------------------|
| 1     | Punjab             | 36                            |
| 2     | Sindh              | 29                            |
| 3     | Khyber Pakhtunkhwa | 35                            |
| 4     | Balochistan        | 35                            |
| Total |                    | 135                           |

## Step 3: Preparation of flood extent mask

The flood extent map was prepared for August, and September 2022. Details about the duration and data used is provided in Table 2. The water body is extracted after applying the Edge Otsu algorithm. The seasonal waterbodies (presence of water for more than eight months) are removed using Joint Research Centre (JRC) water body data (Pekel *et al.*, 2016) and national river and water bodies data. The data is further filtered using a slope map based on shuttle radar topography mission (SRTM) data (slope >15 degrees) to remove the synthetic aperture radar (SAR) terrain shadow areas and desert areas.

Table 3. Flood extent products prepared for floods 2022 in Pakistan using Sentinel 1 and Sentinel 2

| ID | Month     | Duration | Year | Data                      |
|----|-----------|----------|------|---------------------------|
| 1  | August    | 1 - 31   | 2022 | Sentinel 1 and Sentinel 2 |
| 2  | September | 1 - 19   | 2022 | Sentinel 1                |

## Step 4: Preparation of agriculture mask

Agricultural mask has been prepared by extracting the data for herbaceous crops irrigated, herbaceous crops rainfed, herbaceous crops in flood plain and tree orchards from land cover data prepared by FAO in 2021 for Punjab, Sindh, Khyber Pakhtunkhwa and Balochistan.

## Step 5: Preparation of crop type mask

Normalized Difference Vegetation Index (NDVI) time series clustering approach to classify different type of crops. Crop calendar is used for the preparation of crop mask for each crop (Table 1). Sentinel 2 satellite data at 10 m spatial resolution and 5-12 days temporal resolution, is used for the duration of April 2021 - October 2021. Crop types are identified on their phenological development and their corresponding reflectance characteristics in multitemporal satellite images. Erdas Imagine, Google Earth Engine (GEE) and System for Earth Observation



Data Access, Processing and Analysis for Land Monitoring (SEPAL) platforms is used for processing the data.

**Step 6: Overlay and zonal statistics**

Using AOI at province and district level, the agricultural area using land cover 2021, crop type mask, and population data at district level is overlaid to flood extent to delineate the flooded agricultural area, flooded crop type lands and people exposed to floods. The GAUL, WFP 2015 is used to extract the statistics at the province and district levels.

## 2. Results

### 2.1. Area of interest and time period

Delineating the administrative boundaries is the most important step in the impact assessment of any disaster (Figure 2). Table 3 reports the number of provinces and districts using national boundaries for the duration of 1 – 31 August 2022. Total four provinces and 135 districts have been selected.

Figure 2. Area of interest at province level for rapid flood impact assessment in Pakistan for the period 1-31 August 2022



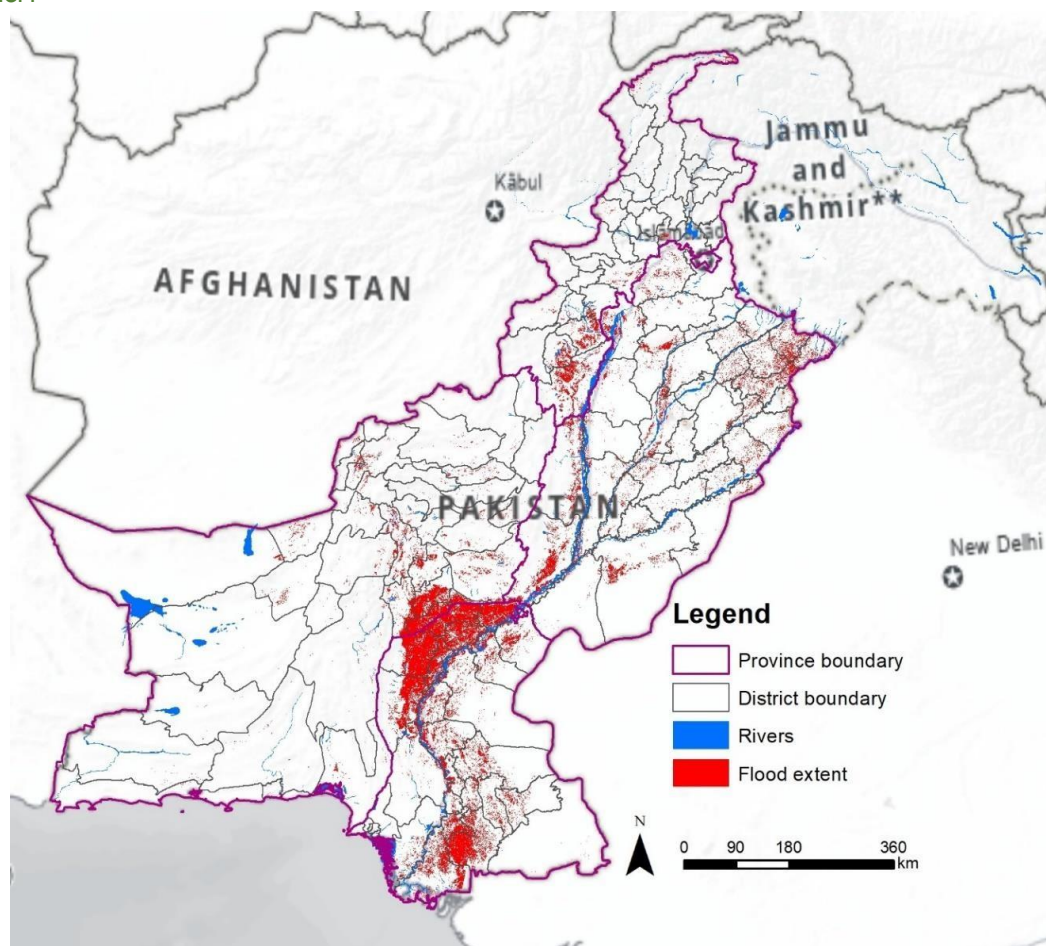
Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).  
Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

Note: Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

## 2.2. Geospatial assessment of flood extent

The results reveal that a total **49 958 km<sup>2</sup>** area (196 521 966 acres; 6.3 percent of the total land area) have been flooded during the month of August 2022 (Figure 3). Province Sindh is the most impacted province in terms of flood extent (Table 4). The complete list of administrative units with information on on flood extent using Sentinel 1 and 2 is provided in Annex I.

Figure 3. Flood extent at provincial level in Pakistan during the period of 1–31 August 2022 using Sentinel1



Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail). Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

Note: Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

Table 4. Flood extent at provincial level for the duration of 1 – 31 August 2022 using Sentinel 1

| ID | Province           | Provincial area (km <sup>2</sup> ) | Flooded area (km <sup>2</sup> ) | Flooded area percentage (%) |
|----|--------------------|------------------------------------|---------------------------------|-----------------------------|
| 1  | Sindh              | 140 883                            | 25 440                          | 18.1                        |
| 2  | Balochistan        | 347 667                            | 8 247                           | 2.4                         |
| 3  | Khyber Pakhtunkhwa | 100 988                            | 3 451                           | 3.4                         |
| 4  | Punjab             | 205 759                            | 12 820                          | 6.2                         |
|    | Total              | 795 297                            | 49 958                          | 6.3                         |

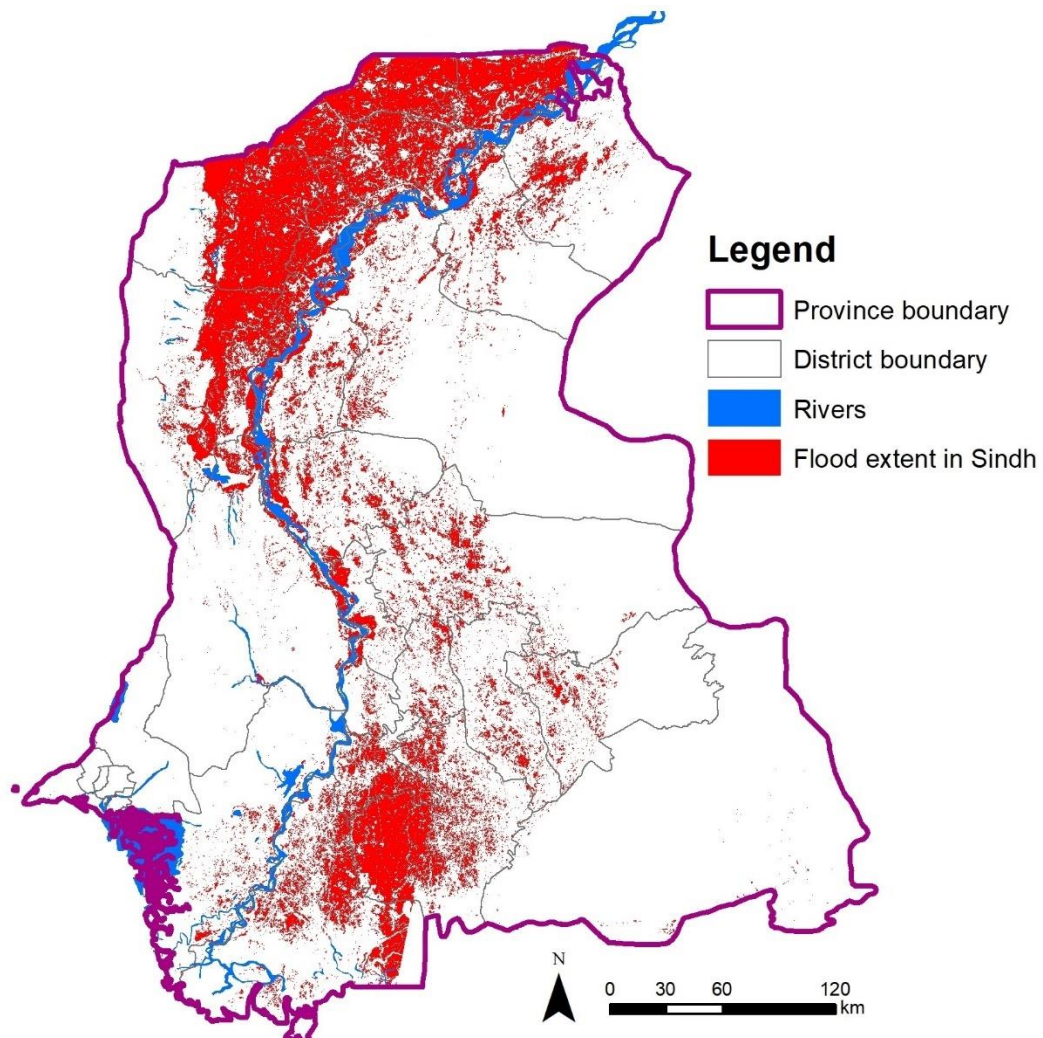
### 2.2.1. Flood extent in Sindh

The result shows that **25 440 km<sup>2</sup>** land area (6 286 362 acres, 18 percent of the total land area) has been inundated in the the Sindh province in August 2022. Following are the top five districts with the highest flood extent. The complete list of administrative units with information on on flood extent is provided in Annex I.

#### Highest impacted districts based on area in km<sup>2</sup>:

1. Kambar Shahdad Kot (3 339 km<sup>2</sup>, 60 percent)
2. Badin (2 853 km<sup>2</sup>, 43 percent)
3. Dadu (2 278 km<sup>2</sup>, 28 percent)
4. Jacobabad (2 261 km<sup>2</sup>, 84 percent)
5. Sujawal (1 847 km<sup>2</sup>, 21 percent)

Figure 4. Flood extent at administrative level 2 (i.e. district) in Sindh province during 1 – 31 August 2022 using Sentinel 1



Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).  
Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

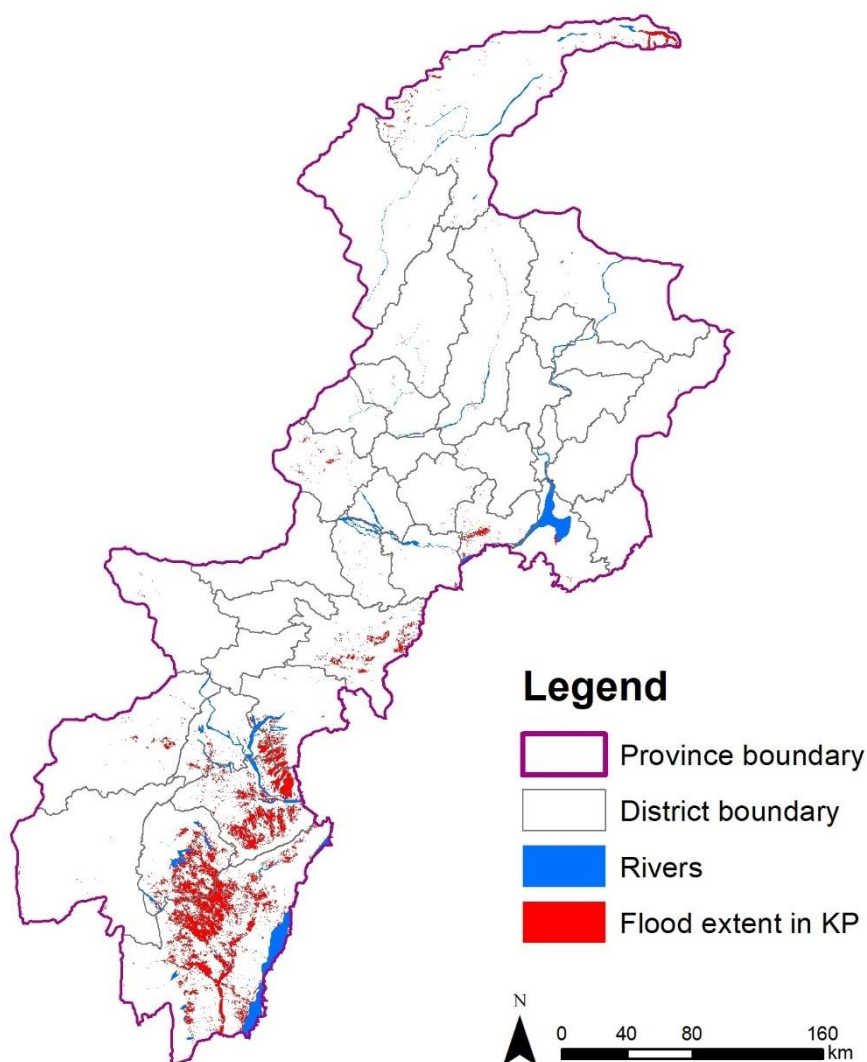
## 2.2.2. Flood extent in Khyber Pakhtunkhwa

The result shows that 3 451 km<sup>2</sup> land area (852 851 acres, 2 percent of the total land area) has been flooded in the Khyber Pakhtunkhwa province. Following are the top five districts with the highest flood extent. The complete list of administrative units with information on on flood extent is provided in Annex I.

### Highest impacted districts based on area in km<sup>2</sup>:

1. D. I. Khan (1 467 km<sup>2</sup>, 16 percent)
2. Lakki Marwat (729 km<sup>2</sup>, 22 percent)
3. Tank (510 km<sup>2</sup>, 18 percent)
4. Kohat (178 km<sup>2</sup>, 5 percent)
5. Chitral upper (152 km<sup>2</sup>, 2 percent)

Figure 5. Flood extent at administrative level 2 (i.e. district) in Khyber Pakhtunkhwa province during 1 – 31 August 2022 using Sentinel 1



Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).  
Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>



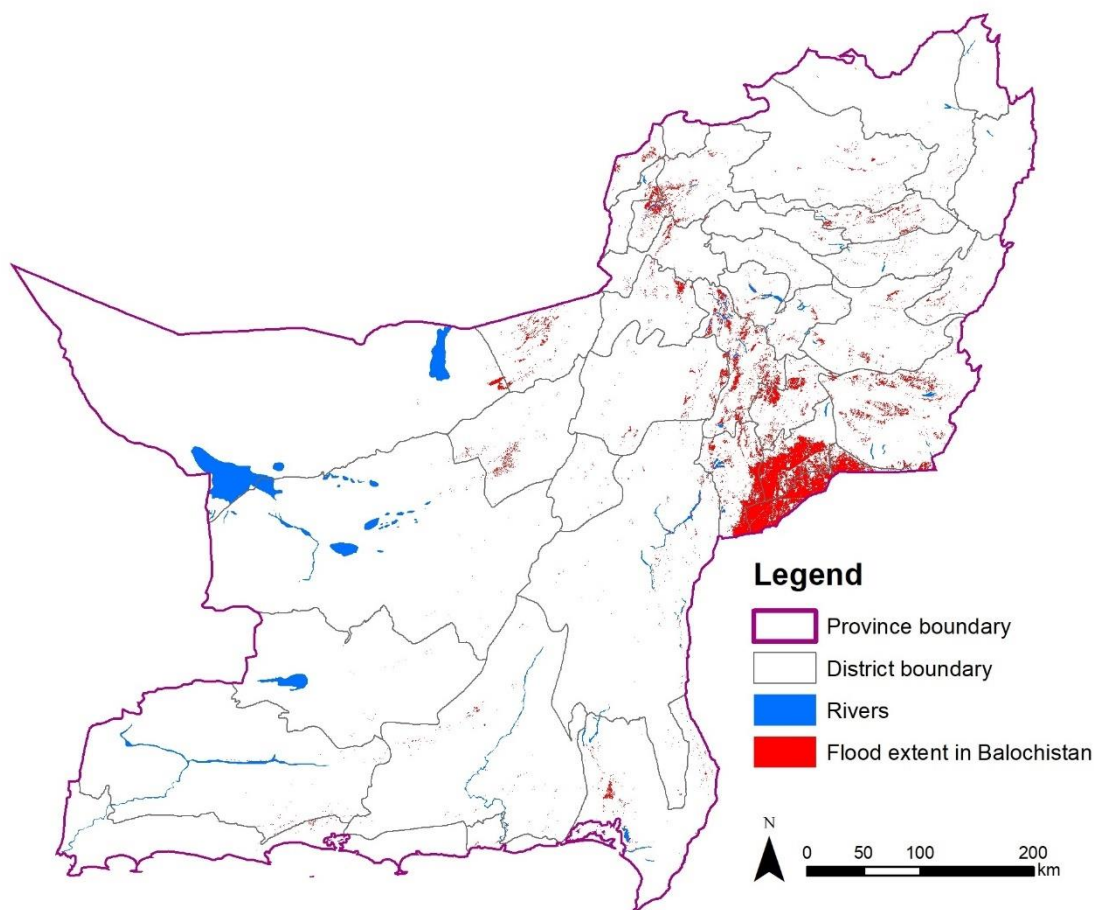
### 2.2.3. Flood extent in Balochistan

The result shows that **8 247 km<sup>2</sup>** land area (2 037 809 acres, 2.4 percent of the total land area) has been flooded in the the Balochistan province. Following are the top five districts with the highest flood extent. The complete list of administrative units with information on on flood extent is provided in Annex I.

#### Highest impacted districts based on area in km<sup>2</sup>:

1. Nasirabad (1 545 km<sup>2</sup>, 48 percent)
2. Jaffarabad (1 455 km<sup>2</sup>, 86 percent)
3. Jhal Magsi (840 km<sup>2</sup>, 22 percent)
4. Kachhi (731 km<sup>2</sup>, 14 percent)
5. Dera Bugti (653 km<sup>2</sup>, 6 percent)

Figure 6. Flood extent at administrative level 2 (i.e. district) in Balochistan province during 1 – 31 August 2022 using Sentinel 1



Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).  
Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>



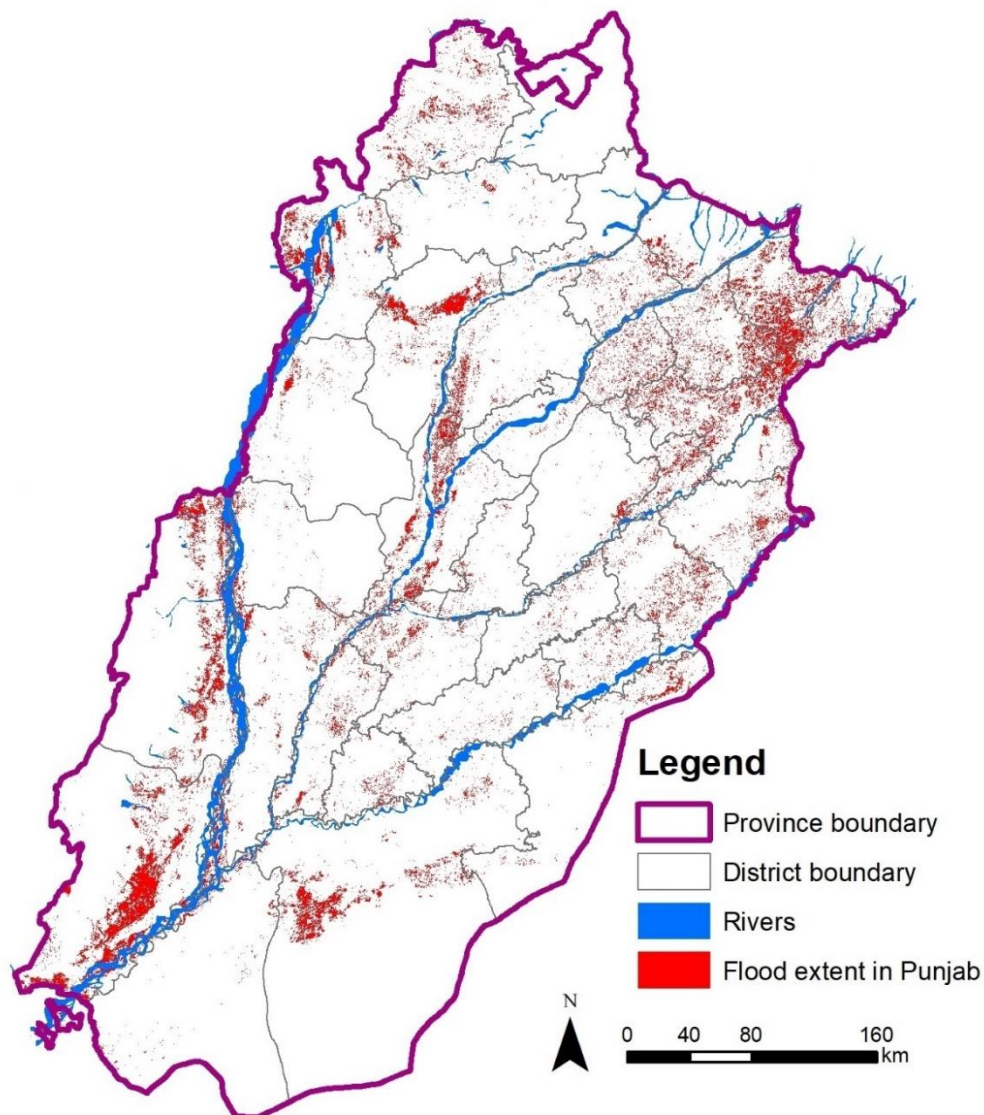
## 2.2.4. Flood extent in Punjab

The result shows that 12 820 km<sup>2</sup> land area (3 167 817 acres, 6.2 percent of the total land area) has been inundated in the the Punjab province. Following are the top five districts with the highest flood extent. The complete list of administrative units with information on on flood extent is provided in Annex I.

### Highest impacted districts based on area in km<sup>2</sup>:

1. Rajanpur (1 666 km<sup>2</sup>, 13 percent)
2. Dera ghazi Khan (1 013 km<sup>2</sup>, 9 percent)
3. Sheikhpura (901 km<sup>2</sup>, 25 percent)
4. Sialkot (824 km<sup>2</sup>, 27 percent)
5. Bahawalpur (823 km<sup>2</sup>, 3 percent)

Figure 7. Flood extent at administrative level 2 (i.e. district) in Punjab province during 1 – 31 August 2022 using Sentinel 1

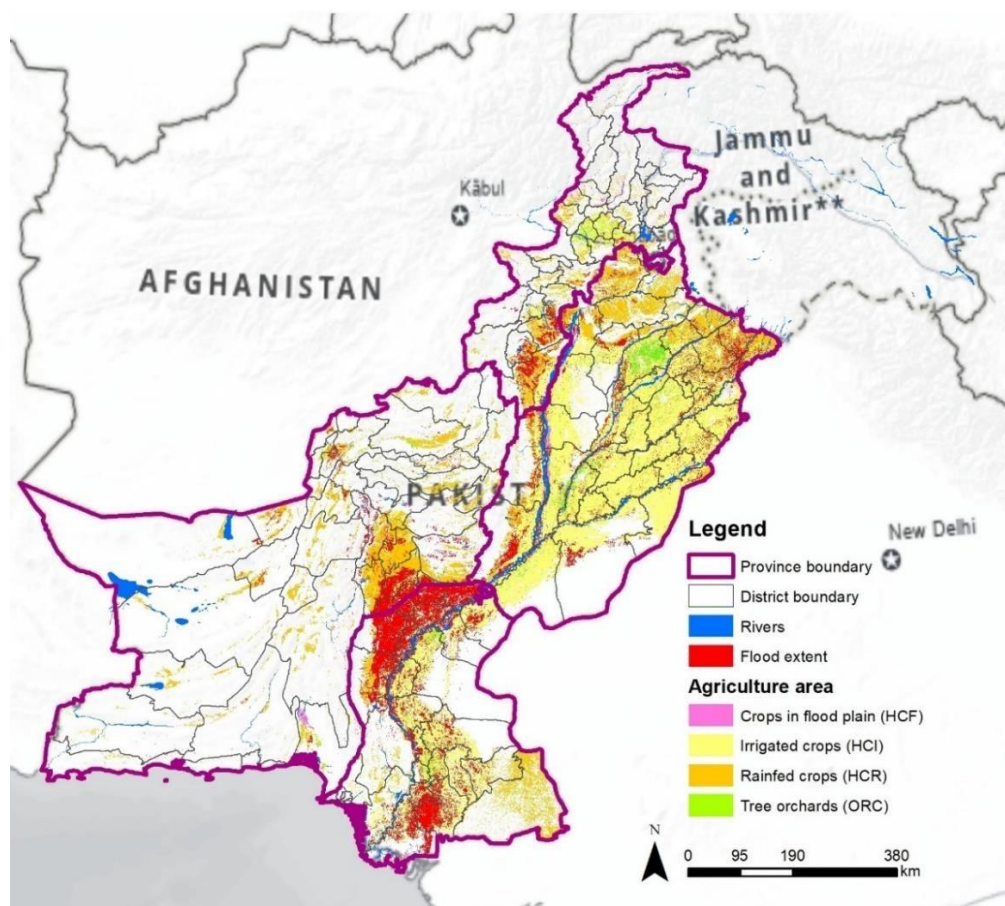


Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).  
Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

## 2.3. Agricultural impact assessment

The results reveal that **38 289 km<sup>2</sup>** (9 461 397 acres; 16 percent of the total agricultural area in AOI) have been flooded in August 2022 (Figure 8). Province Sindh is the most impacted province in terms of flooded agricultural area based on percentage (37 percent of the total agriculture area in Sindh) (Table 5). The complete list of administrative units with information on impacted agricultural area is provided in Annex II.

Figure 8. Flooded agricultural area in Sindh, Punjab, Khyber Pakhtunkhwa and Balochistan during the period of 1–31 August 2022 using Sentinel 1



Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail). Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

Note: Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

Table 5. Impacted agriculture area by floods at province level during 1–31 August 2022 in Pakistan

| ID | Province           | Total agricultural area using land cover 2021 (km <sup>2</sup> ) | Flooded agricultural area (km <sup>2</sup> ) | Flooded agricultural area percentage (%) |
|----|--------------------|--|--|--|
| 1  | Balochistan        | 33 750   | 4 972  | 15                                       |
| 2  | Punjab             | 127 511  | 10 989                                       | 9  |
| 3  | Sindh              | 52 981   | 19 436                                       | 37                                       |
| 4  | Khyber Pakhtunkhwa | 18 481   | 2 892  | 16                                       |
|    | Total              | 232 723  | 38 289                                       | 16                                       |

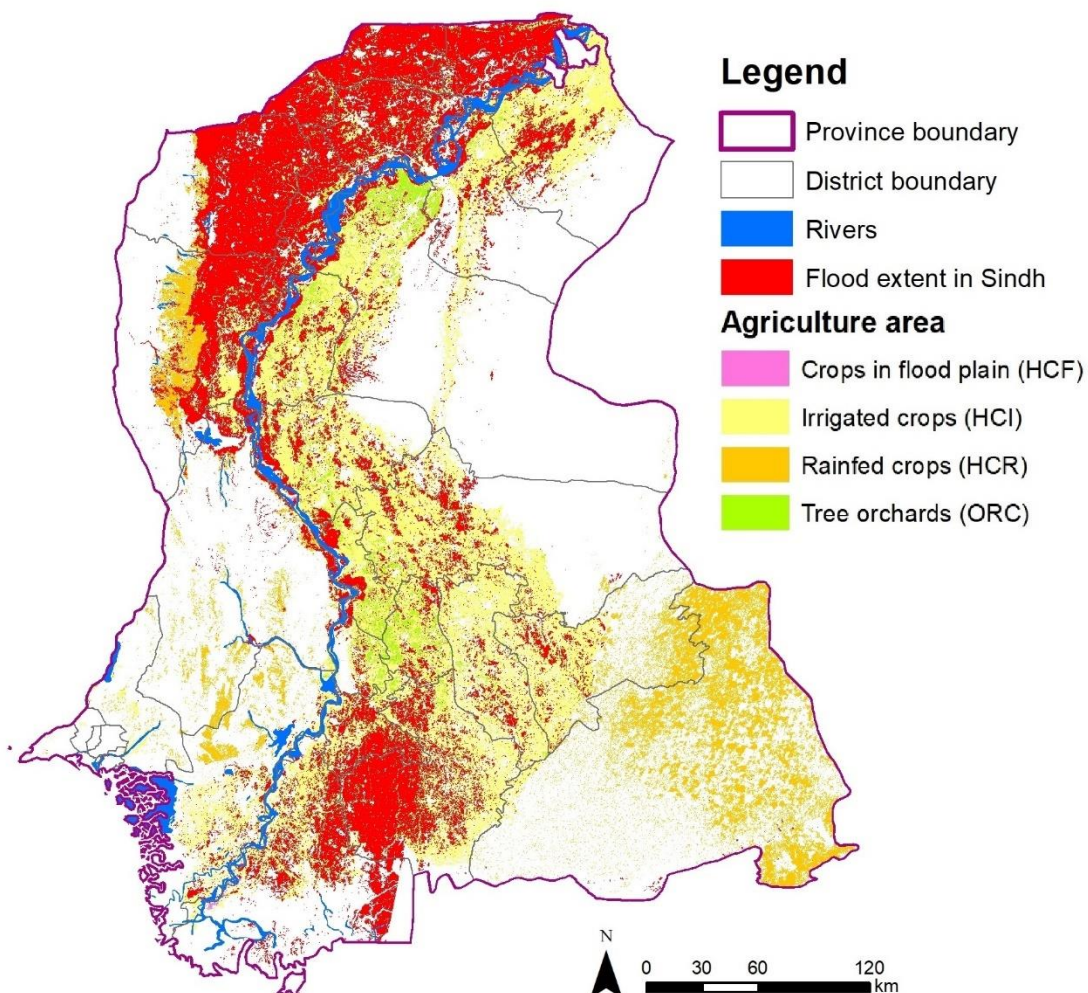
### 2.3.1. Impacted agricultural area in Sindh

The result shows that **19 436 km<sup>2</sup>** agricultural area (4 802 737 acres, 37 percent of the total agricultural area in Sindh) has been flooded in the Sindh province in August 2022. Following are the top five districts with the highest flooded agricultural area. Further details at administrative level 2 are provided in Annex II on impacted agricultural area.

#### Highest impacted districts based on area in km<sup>2</sup>:

1. Kambar Shahdad Kot (2 555 km<sup>2</sup>, 93 percent)
2. Badin (2 371 km<sup>2</sup>, 53 percent)
3. Jacobabad (1 919 km<sup>2</sup>, 93 percent)
4. Dadu (1 906 km<sup>2</sup>, 55 percent)
5. Shikarpur (1 462 km<sup>2</sup>, 82 percent)

Figure 9. Flooded agricultural area at district level in Sindh province during the period 1 – 31 August 2022 using Sentinel 1



Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail). Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>



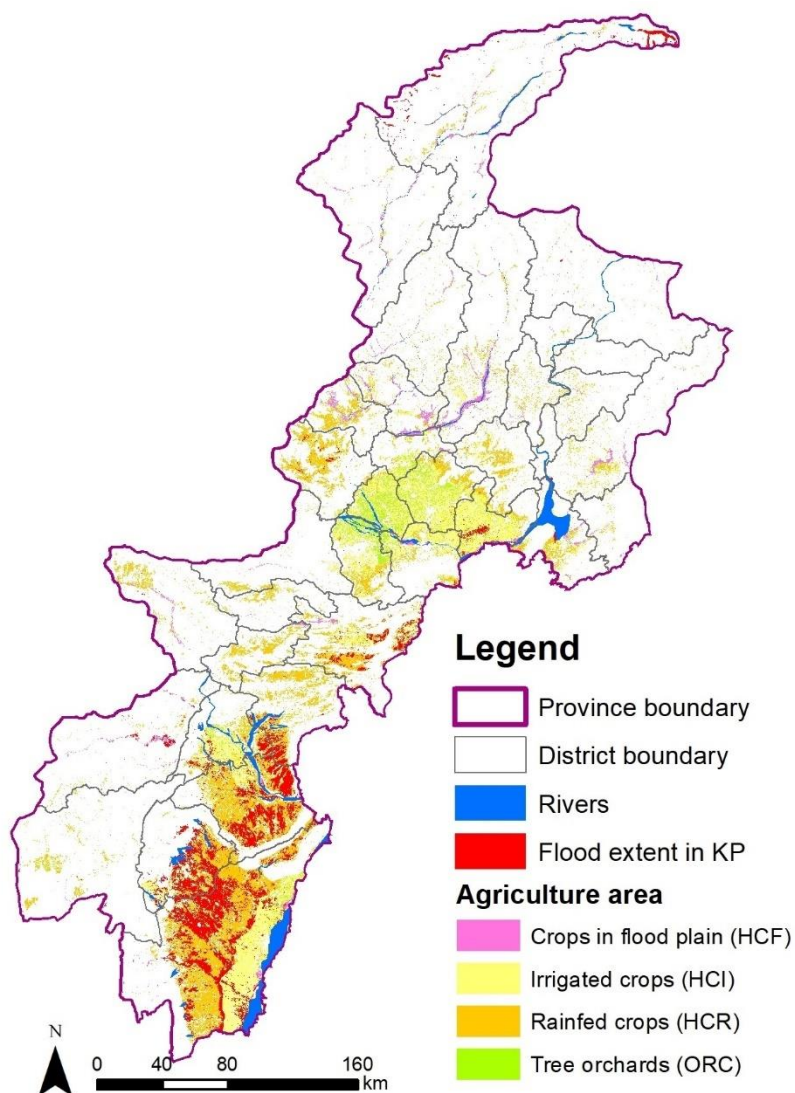
### 2.3.2. Impacted agricultural area in Khyber Pakhtunkhwa

The result shows that 2 892 km<sup>2</sup> agricultural area (714 634 acres, 16 percent of the total agricultural area in Khyber Pakhtunkhwa) has been flooded in the Khyber Pakhtunkhwa province in August 2022. Following are the top five districts with the highest flooded agricultural area. Further details at administrative level 2 are provided in Annex II on impacted agricultural area.

#### Highest impacted districts based on area in km<sup>2</sup>:

1. D. I. Khan (1 270 km<sup>2</sup>, 26 percent)
2. Lakki marwat (702 km<sup>2</sup>, 34 percent)
3. Tank (418 km<sup>2</sup>, 45 percent)
4. Kohat (165 km<sup>2</sup>, 20 percent)
5. Karak (114 km<sup>2</sup>, 16 percent)

Figure 10. Flooded agricultural area at district level in Khyber Pakhtunkhwa province during the period 1 – 31 August 2022 using Sentinel 1



Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).  
Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

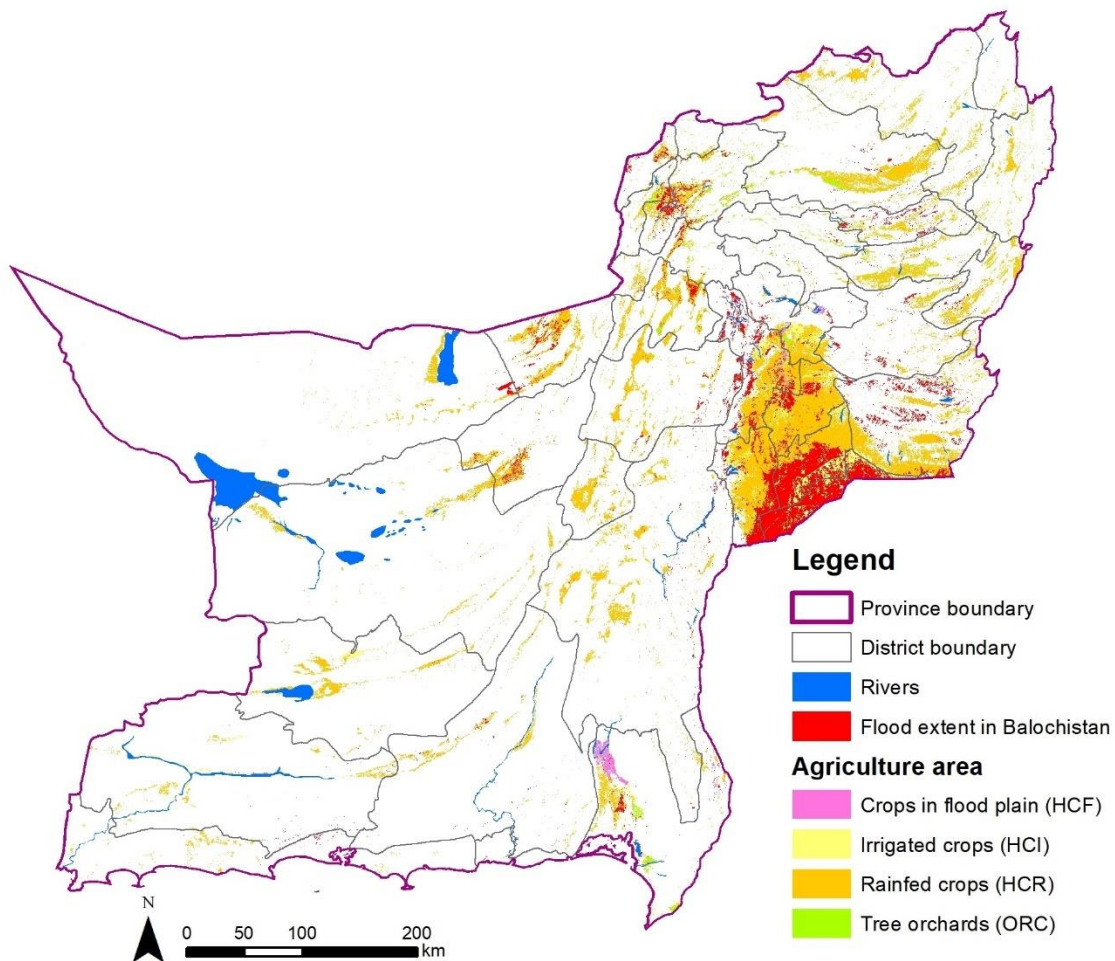
### 2.3.3. Impacted agricultural area in Balochistan

The results show that 4 972 km<sup>2</sup> agricultural area (1 228 531 acres, 15 percent of the total agriculture area in Balochistan) has been inundated in the Balochistan province in August 2022. Following are the top five districts with the highest flooded agricultural area. Further details at administrative level 2 are provided in Annex II on impacted agricultural area.

#### Highest impacted districts based on area in km<sup>2</sup>:

1. Jaffarabad (1 737 km<sup>2</sup>, 77 percent)
2. Nasirabad (1 622 km<sup>2</sup>, 48 percent)
3. Jhal Magsi (448 km<sup>2</sup>, 15 percent)
4. Sibi (178 km<sup>2</sup>, 7 percent)
5. Kachhi (bolan) (170 km<sup>2</sup>, 5 percent)

Figure 11. Flooded agricultural area at district level in Balochistan province during the period 1 – 31 August 2022 using Sentinel 1



Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).  
Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

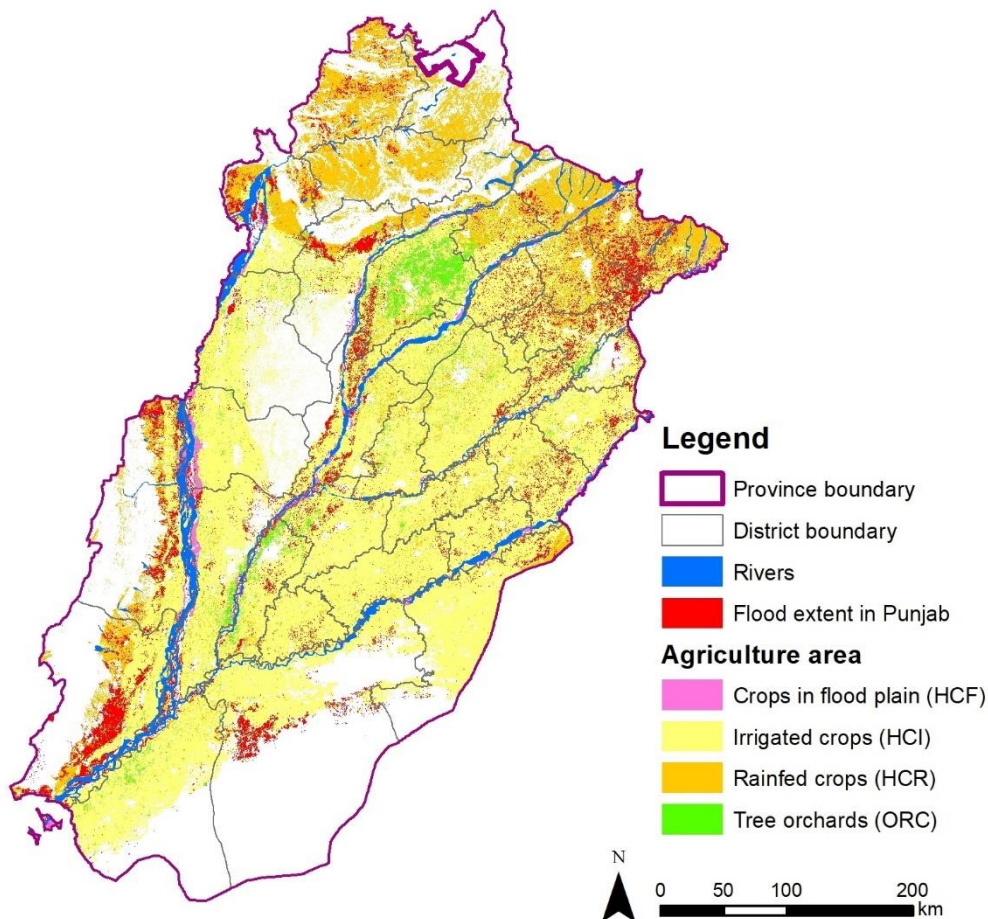
### 2.3.4. Impacted agricultural area in Punjab

The results show that a total of **10 989 km<sup>2</sup>** (2 715 496 acres, 9 percent of the total agriculture area in Punjab) agriculture area has been flooded in the Punjab province in August 2022. Following are the top five districts with the highest flooded agricultural area. Further details at administrative level 2 are provided in Annex II on impacted agricultural area.

#### Highest impacted districts based on area in km<sup>2</sup>:

1. Rajanpur (1 111 km<sup>2</sup>, 20 percent)
2. Sheikhpura (948 km<sup>2</sup>, 24 percent)
3. Dera Ghazi Khan (937 km<sup>2</sup>, 19 percent)
4. Sialkot (791 km<sup>2</sup>, 30 percent)
5. Gujranwala (651 km<sup>2</sup>, 21 percent)

Figure 12. Flooded agricultural area at district level in Punjab province during the period 1 – 31 August 2022 using Sentinel 1



Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).  
Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>



## 2.4. Crop type area impact assessment

The crop type impact assessment considers rice, sugarcane, cotton, and wheat. The methodology is explained in the section 1, and it is important to consider that these crop types are not cultivated at the same time. Here, the assessment provides information on potentially affected cropland using remote sensing. For example, wheat is not yet cultivated at the time of the remote sensing analysis. However, it is expected that in some areas wheat cultivation and expected cultivation starting in November (see crop calendar Table 1) might be impacted considering the flood extent during the month of August and September therefore, the results show potential impacts on upcoming cultivation of wheat.

### 2.4.1. Impacted crop type area in Sindh

In Table 6, overall statistics at administrative level 1, i.e. at province level for the Sindh province, is provided for rice mask, impacted rice area, cotton mask, impacted cotton area, sugarcane mask, impacted sugarcane, wheat mask and potentially impacted wheat cultivation area that are assessed using flood extent based on sentinel 1 data for the time period of 1–31 August 2022. The complete list of administrative units with information on impacted crop type area is provided in Annex III.

Table 6. Flooded crop type area in Sindh during 1–31 August 2022 using Sentinel 1

| ID | Crop type <sup>4</sup> | Cultivated cropland area in 2021 (km <sup>2</sup> ) | Flooded cropland area (km <sup>2</sup> ) | Percentage of flooded cropland area (%) |
|----|------------------------|---|--|---|
| 1  | Rice                   | 11 900  | 7 043                                    | 59                                      |
| 2  | Sugarcane              | 3 016   | 361                                      | 12                                      |
| 3  | Cotton                 | 7 637   | 1 048                                    | 14                                      |
| 4  | Wheat                  | 8 077   | 4 041                                    | 50                                      |

### 2.4.2. Impacted crop type area in Khyber Pakhtunkhwa

In Table 7, overall statistics at administrative level 1 for Khyber Pakhtunkhwa province is provided for rice, impacted rice area, cotton, impacted cotton area, sugarcane, impacted sugarcane, wheat and potentially impacted wheat cultivation area that are assessed using flood extent based on sentinel 1 data for the time period of 1–31 August 2022. The complete list of administrative units with information on impacted crop type area is provided in Annex IV.

Table 7. Flooded crop type area in Khyber Pakhtunkhwa during 1–31 August 2022

| ID | Crop type <sup>5</sup> | Cultivated cropland area in 2021 (km <sup>2</sup> ) | Flooded cropland area (km <sup>2</sup> ) | Percentage of flooded cropland area (%) |
|----|------------------------|---|--|---|
| 1  | Rice                   | 55 246  | 2 500                                    | 4.5                                     |
| 2  | Sugarcane              | 691   | 2  | 0.24                                    |
| 3  | Cotton                 | -   | -  | -                                       |
| 4  | Wheat                  | 1 470   | 57                                       | 4                                       |

<sup>4</sup> Potentially impacted cropland by crop type considering 2021 cultivated cropland area and flood extent for 1-31 August 2022 using Sentinel 1 in Sindh.

<sup>5</sup> Potentially impacted cropland by crop type considering 2021 cultivated cropland area and flood extent for 1-31 August 2022 using Sentinel 1 in Khyber Pakhtunkhwa.

### 2.4.3. Impacted crop type area in Balochistan

In Table 8, overall statistics at administrative level 1 for Balochistan are provided for rice, impacted rice area, cotton, impacted cotton area, sugarcane, impacted sugarcane, wheat and potentially impacted wheat cultivation area that are assessed using flood extent based on sentinel 1 data for the time period of 1 – 31 August 2022. The complete list of administrative units with information on impacted crop type area is provided in Annex V.

Table 8. Flooded crop type area in Balochistan during 1–31 August 2022

| ID | Crop type <sup>6</sup> | Cultivated cropland area in 2021 (km <sup>2</sup> ) | Flooded cropland area (km <sup>2</sup> ) | Percentage of flooded cropland area (%) |
|----|------------------------|---|--|---|
| 1  | Rice                   | 1 215   | 506                                      | 42                                      |
| 2  | Sugarcane              | 129   | 0  | 0.02                                    |
| 3  | Cotton                 | 2 585   | 73                                       | 3                                       |
| 4  | Wheat                  | 587   | 199                                      | 34                                      |

### 2.4.4. Impacted crop type area in Punjab

In Table 9, overall statistics at administrative level 1 for Punjab province, are provided for rice mask, impacted rice area, cotton mask, impacted cotton area, sugarcane mask, impacted sugarcane, wheat mask and potentially impacted wheat cultivation area that are assessed using flood extent based on sentinel 1 data for the time period of 1 – 31 August 2022. The complete list of administrative units with information on impacted crop type area is provided in Annex VI.

Table 9. Flooded crop type area in Punjab during 1–31 August 2022

| ID | Crop type <sup>7</sup> | Cultivated cropland area in 2021 (km <sup>2</sup> ) | Inundated cropland area (km <sup>2</sup> ) | Percentage of inundated cropland area (%) |
|----|------------------------|---|--|---|
| 1  | Rice                   | 32 703  | 4 877                                      | 15  |
| 2  | Sugarcane              | 23 475  | 639  | 3   |
| 3  | Cotton                 | 5 979   | 177  | 3   |
| 4  | Wheat                  | 36 216  | 3 314                                      | 9   |

<sup>6</sup> Potentially impacted cropland by crop type considering 2021 cultivated cropland area and flood extent for 1-31 August 2022 using Sentinel 1 in Balochistan.

<sup>7</sup> Potentially impacted cropland by crop type considering 2021 cultivated cropland area and flood extent for 1-31 August 2022 using Sentinel 1 in Punjab.

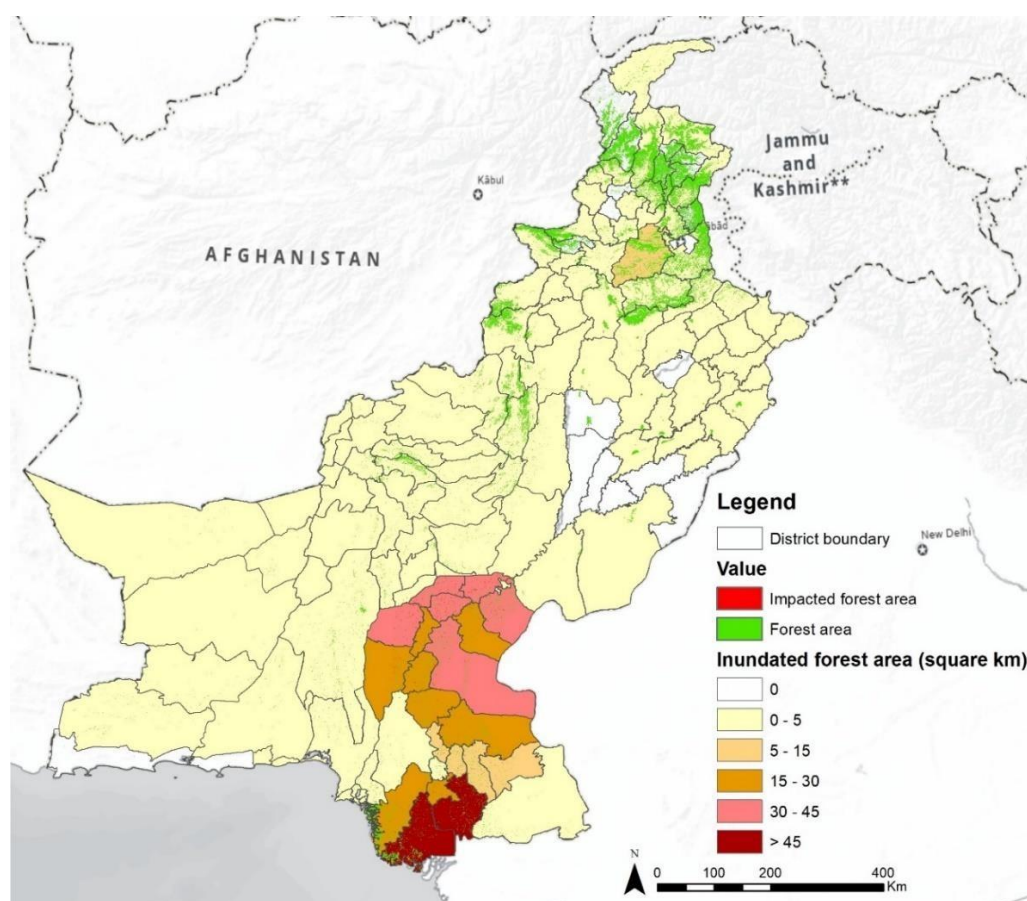
## 2.5. Forest area impact assessment

The results reveal that **580 km<sup>2</sup>** forest area (143 321 acres; 2 percent of the total forest area) has been inundated in AOI (Figure 13). Province Sindh is the most impacted province in terms of flooded forest area based on the percentage (13 percent of the total forest area in Sindh). Details for flooded forest area at administrative level 2 i.e. district is provided in Annex VII.

Table 10. Flooded forest area at administrative level 1 i.e. province for the duration of 1–31 August 2022 using Sentinel 1

| ID | Province           | Forest area | Flooded forest area (km <sup>2</sup> ) | Percentage of flooded forest area (%) |
|----|--------------------|-------------|--|---------------------------------------|
| 1  | Sindh              | 4 019       | 535                                    | 13.32                                 |
| 2  | Balochistan        | 3 929       | 14                                     | -                                     |
| 3  | Khyber Pakhtunkhwa | 19 007      | 5                                      | 0.03                                  |
| 4  | Punjab             | 8 610       | 26                                     | 0.30                                  |
|    | Total              | 35 565      | 580                                    | 1.63                                  |

Figure 13. Flooded forest area in km<sup>2</sup> at administrative level 2 i.e. district in Sindh province during 1–31 August 2022 using Sentinel 1



Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).  
Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

Note: Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

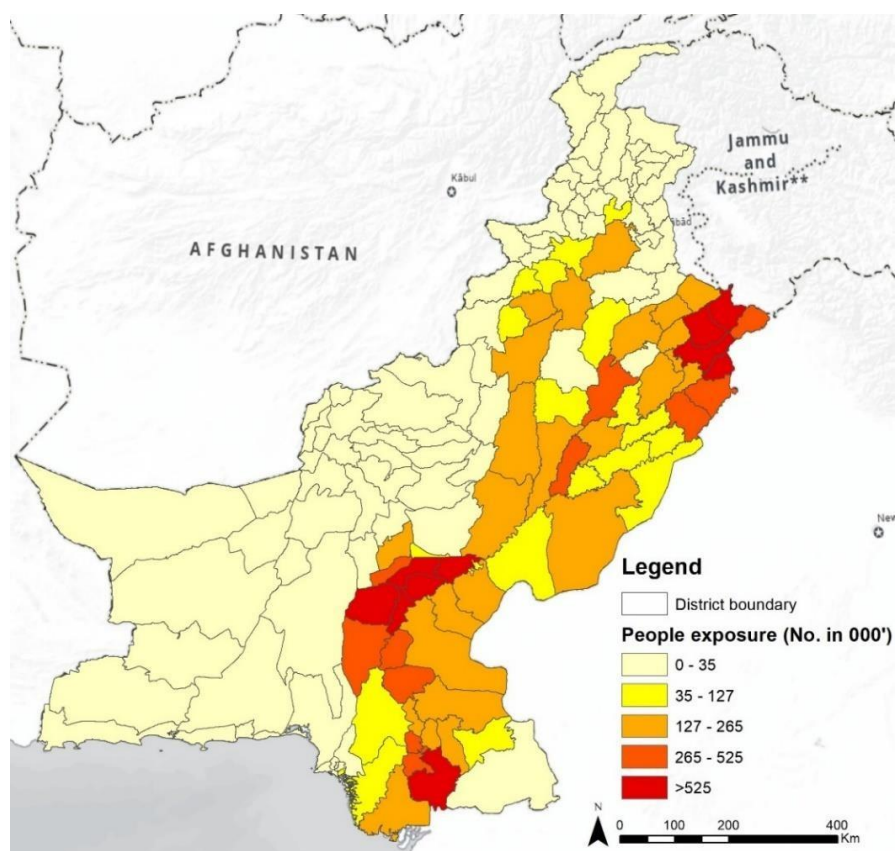
## 2.6. People’s exposure to floods

The results revealed that around 20 million people have been exposed to floods in the AOI (Figure 14). Table 11 provides the details at administrative level 1 i.e. at province level for people exposed to floods for the duration of 1 – 31 August 2022 using Sentinel 1 flood extent and WorldPop 2020 data. Details at administrative unit 2 i.e. at district level are provided in Annex VIII.

Table 11. People exposed to floods in Pakistan at administrative level 1 i.e. province during 1–31 August 2022

| ID | Province           | Flooded area (km <sup>2</sup> ) | Population (000’) | Exposed population to floods (000’) |
|----|--------------------|---------------------------------|-------------------|-------------------------------------|
| 1  | Khyber Pakhtunkhwa | 3 451                           | 37 462            | 844                                 |
| 2  | Punjab             | 12 820                          | 127 820           | 9 273                               |
| 3  | Sindh              | 25 440                          | 50 521            | 9 239                               |
| 4  | Balochistan        | 8 247                           | 8 411             | 756                                 |
|    | Total              | 49 958                          | 224 215           | 20 112                              |

Figure 14. People exposed to floods in Pakistan at administrative level 2 i.e. district during 1–31 August 2022



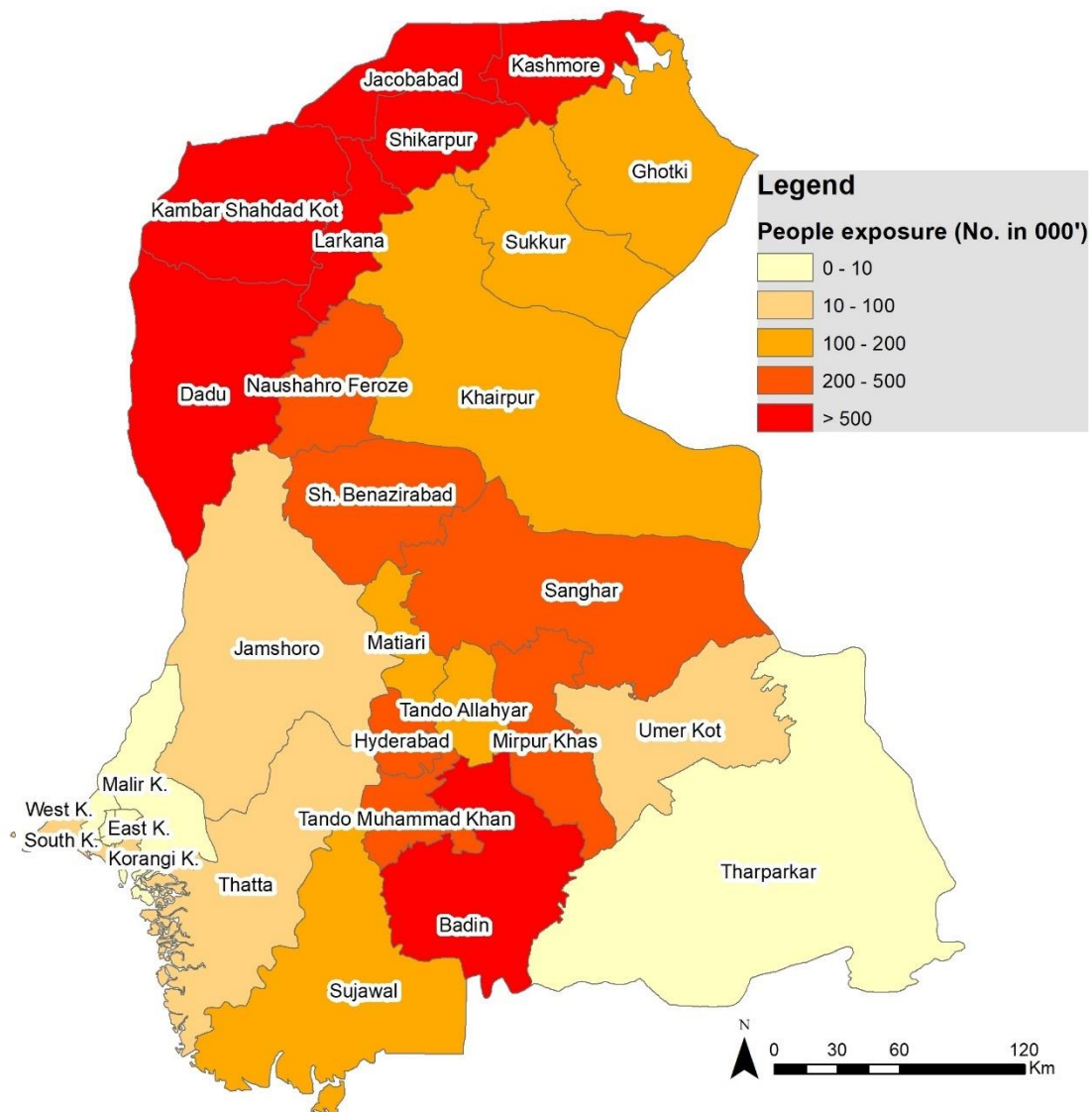
Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).  
 Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

Note: Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

### 2.6.1. People exposed to floods in Sindh

The results suggested that **9 million** people have been exposed to floods in Sindh province (Figure 15). The complete list of administrative units with information on population exposure to flood extent is provided at district level in Annex VIII. The most impacted districts with the highest number of people exposed to floods are Kambar Shahdad Kot, Jacobabad, Dadu, Shikarpur, Larkana and Badin in Sindh.

Figure 15. People exposed to floods in Sindh at administrative level 2 i.e. district during 1–31 August 2022



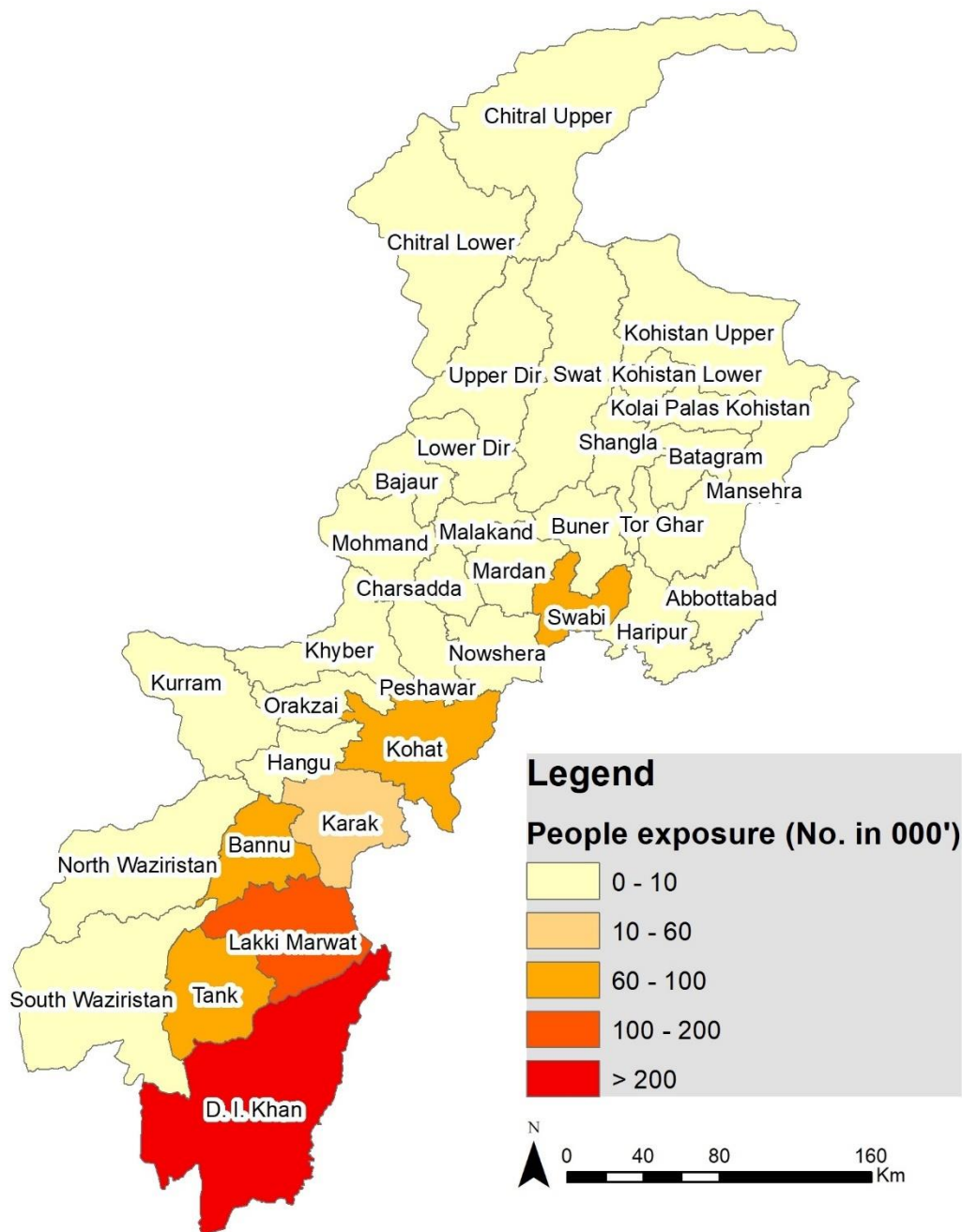
Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).  
 Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>



## 2.6.2. People exposed to floods in Khyber Pakhtunkhwa

The results suggest that **850 000** people have been exposed to floods in Khyber Pakhtunkhwa province (Figure 16). The complete list of administrative units with information on population exposure to flood extent is provided at district level in Annex VIII. The most impacted districts with the highest number of people exposed to floods are D. I. Khan, Lakki Marwat, Tank, Bannu, Kohat and Swabi.

Figure 16. People exposed to floods in Khyber Pakhtunkhwa at administrative level 2 i.e. district during 1–31 August 2022



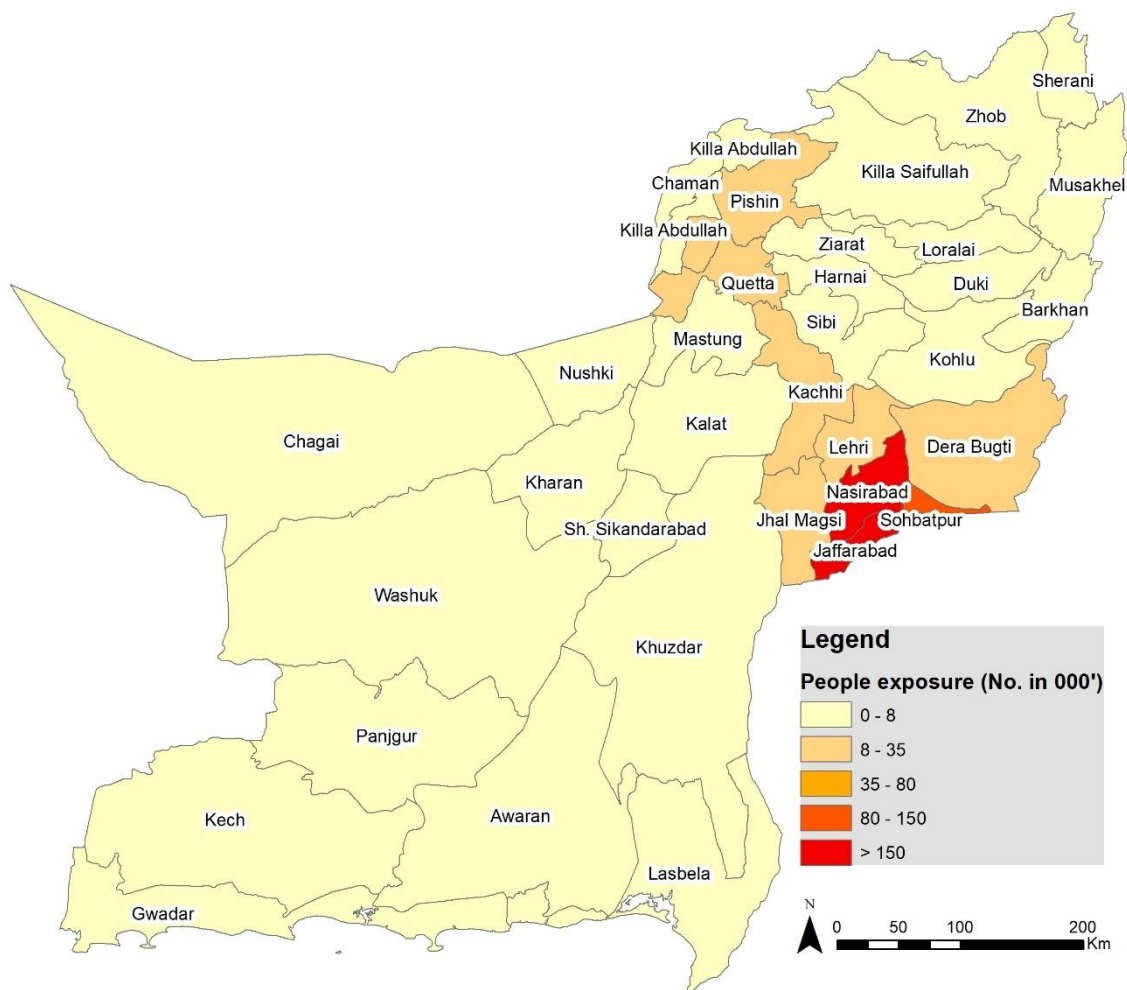
Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail). Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>



### 2.6.3. People exposed to floods in Balochistan

The results suggest that almost 750 000 people have been exposed to floods in Balochistan province (Figure 17). The complete list of administrative units with information on population exposure to flood extent is provided at district level in Annex VIII. The most impacted districts with the highest number of people exposed to floods are Jaffarabad, Nasirabad, Sohbatpur, Kachhi, Jhal Magsi and Pishin.

Figure 17. People exposed to floods in Balochistan during the period 1–31 August 2022

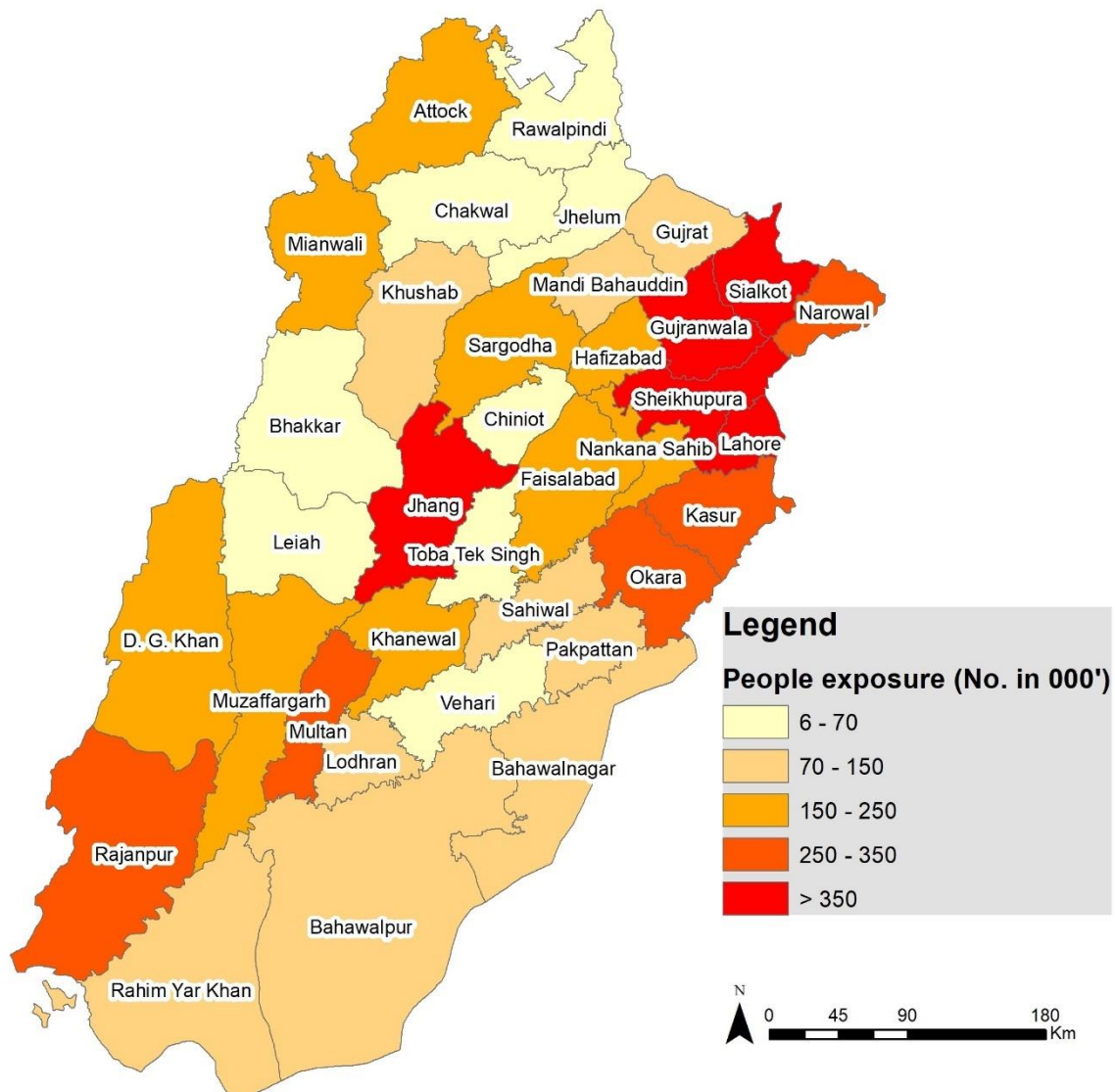


Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail). Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

### 2.6.4. People exposed to floods in Punjab

The results suggested that almost 9 million people have been exposed to floods in Punjab province (Figure 19). The complete list of people exposure is provided at district level in Annex VIII. The most impacted districts with the highest number of people exposed to floods are Sialkot, Gujranwala, Sheikhupura, Lahore, Jhang and Narowal.

Figure 18. People exposed to floods in Punjab during the period 1–31 August 2022



Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).  
 Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

## 3. Evolution of flood extent in view of the Rabi season

### 3.1. Extent of the floods in September 2022

The assessment of flood extent and agricultural land under water in September 2022 (duration 1 – 19) has been prepared using the same methodology and resources (sentinel 1) as those used for August 2022 (duration 1 – 31).

The results regarding flood extent in September 2022 as compared to flood extent in August 2022 (Figure 19 and Table 12) reveal that:

- Water has receded in all provinces. Total flood extent reduced by 87 percent, from 50 000 to 34 000 km<sup>2</sup>.
- Sindh province is still the most impacted province with 3 percent of the total land area still having standing water and a reduction of flood extent by 77 percent from 25 440 to 5 754 km<sup>2</sup>.

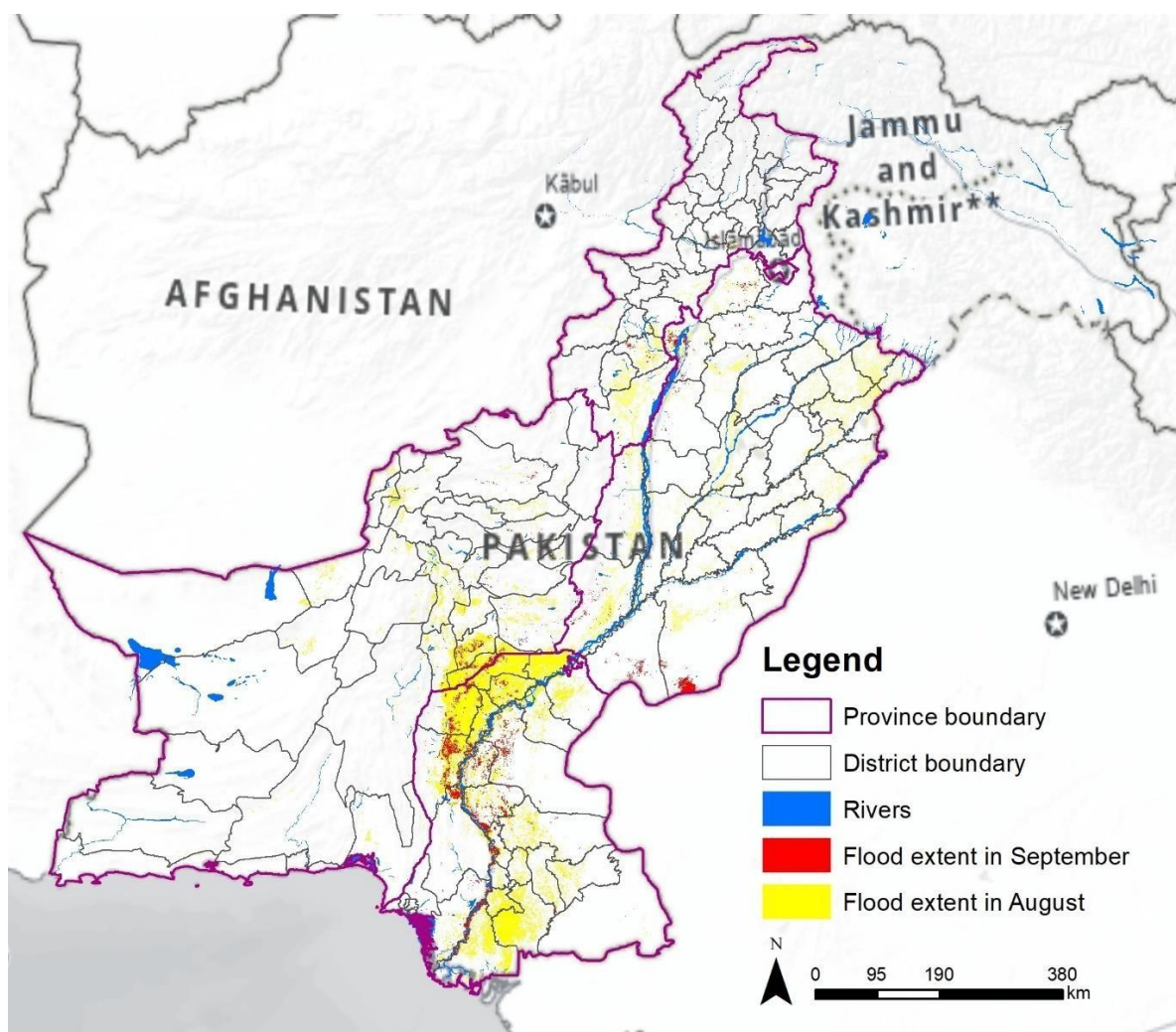
The complete list of administrative units with information on flood extent is provided in Annex IX for September 2022. Following is the list of five most impacted districts based on area in km<sup>2</sup> due to flood extent during 1 – 19 September 2022 in selected provinces.

- Sindh: Dadu (757 km<sup>2</sup>), Khairpur (475 km<sup>2</sup>), Shaheed Benazir Abad (456 km<sup>2</sup>), Naushahro Feroze (423 km<sup>2</sup>), and Kambar Shahdad Kot (385 km<sup>2</sup>).
- Punjab: Bahawalpur (528 km<sup>2</sup>), Mianwali (244 km<sup>2</sup>), Rahim Yar Khan (212 km<sup>2</sup>), Rajanpur (139 km<sup>2</sup>), and Attock (90 km<sup>2</sup>).
- Khyber Pakhtunkhwa: Lakki Marwat (73 km<sup>2</sup>), South Waziristan (11 km<sup>2</sup>), Mardan (10 km<sup>2</sup>), D. I. Khan (10 km<sup>2</sup>) and Nowshera (10 km<sup>2</sup>).
- Balochistan: Nasirabad (279 km<sup>2</sup>), Jaffarabad (240 km<sup>2</sup>), Dera bugti (71 km<sup>2</sup>), Killa Saifullah (51 km<sup>2</sup>), and Jhal Magsi (38 km<sup>2</sup>).

Table 12. Comparison of flood extent at province level in August and September 2022 in Punjab, Sindh, KP and Balochistan

| Province           | Total land area (km <sup>2</sup> ) | Flooded area in August (km <sup>2</sup> ) | Flooded area in August (%) | Flooded area in September (km <sup>2</sup> ) | Flooded area in September (%) | Difference (September - August) (km <sup>2</sup> ) |
|--------------------|------------------------------------|---|----------------------------|--|-------------------------------|--|
| Sindh              | 140 883                            | 25 440                                    | 18.06                      | 5 754  | 4.1                           | - 19 686   |
| Balochistan        | 347 667                            | 8 247                                     | 2.37                       | 1 038  | 0.3                           | - 7 209  |
| Khyber Pakhtunkhwa | 100 988                            | 3 451                                     | 3.42                       | 192  | 0.2                           | - 3 259  |
| Punjab             | 205 759                            | 12 820                                    | 6.23                       | 1 341  | 0.7                           | -11 479  |
| Total              | 795 297                            | 49 958                                    | 6.28                       | 6 307  | 1.0                           | - 43 651   |

Figure 19. Flood extent in August and September 2022 in Punjab, Sindh, Khyber Pakhtunkhwa and Balochistan using Sentinel 1



Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).  
Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

Note: Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

### 3.2. Extent of agricultural land still flooded in September 2022

The results regarding flooded agricultural area in September 2022 as compared to flooded agricultural land in August 2022 (Annex X and Table 13) reveals that:

- Most of agricultural land does not have standing water in September 2022. Total flooded agricultural land reduced by 88 percent, from 38 289 to 4 494 km<sup>2</sup>.
- Sindh province is still the most impacted in terms of flooded agricultural land in September 2022 with 19 percent of flooded agricultural land in August 2022 still under water in September, representing 7 percent of total agricultural land in Sindh.
- In Balochistan, out of 15 percent agricultural land inundated in August 2022, water has receded in 13 percent of the flooded agricultural land in September 2022 and hence 98 percent of agricultural land is available for Rabi cultivation.

- In KP, out of 16 percent agricultural land inundated in August 2022, water has receded in 15 percent of the flooded agricultural land in September 2022 and hence 99 percent of agricultural land is available for Rabi cultivation.
- In Punjab, out of 9 percent agricultural land inundated in August, water has receded in 100 percent of the flooded agricultural land in September 2022 and hence 100 percent of agricultural land is available for Rabi cultivation.

The complete list of administrative units with information on flooded agricultural area in September 2022 is provided in Annex X.

Table 13. Comparison of flooded agrocultral area at province level in the month of August and September 2022 in Punjab, Sindh, Khyber Pakhtunkhwa and Balochistan

| Province           | Area under cropland using land cover 2021 (km <sup>2</sup> ) in August | Flooded agricultural area (km <sup>2</sup> ) in August | Flooded agricultural area (km <sup>2</sup> ) in September | Difference (September - August) (km <sup>2</sup> ) |
|--------------------|--|--|---|--|
| Sindh              | 52 981   | 19 436   | 3 657   | -15 779  |
| Balochistan        | 33 750   | 4 972  | 702   | -4 270   |
| Khyber Pakhtunkhwa | 18 480   | 2 892  | 135   | -2 757   |
| Punjab             | 127 511  | 10 989   | 0   | -10 989  |
| Total              | 232 723  | 38 289   | 4 494   | -33 795  |

### 3.3. Potential impacts of floods on wheat cultivation

Forecast of potential impacts of floods on wheat cultivation has been conducted by overlaying areas where wheat is to be cultivated with areas with standing flood waters in September 2022. For mapping cultivated areas under wheat, crop masks of wheat have been prepared using 2021 satellite-based data. The key results of the analysis are as below:

- In Sindh, about 955 km<sup>2</sup> (0.2 million acres) of potentially cultivated wheat crop area is inundated/flooded during the month of September 2022. Around 92 percent of the total wheat cultivation area is available for cultivation.
- In Balochistan, about 39 km<sup>2</sup> (9 676 acres) of potentially cultivated wheat crop area is inundated/flooded during the month of September 2022. Around 99 percent of the total wheat cultivation area is available for cultivation.
- In KP, about 7 km<sup>2</sup> (1 729 acres) of potentially cultivated wheat crop area in Sindh is inundated/flooded during the month of September 2022. 100 percent of the total wheat cultivation area is available for cultivation.
- In Punjab, 100 percent of the potentially cultivated wheat crop area is available for wheat cultivation.



## 4. Conclusions and recommendations

The objective of this assessment is to provide rapid results about the impact of flood in the agricultural sector in Pakistan considering as much as possible national conditions and available new technologies (e.g., data analysis applications). The assessment does not aim to be exhaustive and rather prefers to focus on few priority indicators that have been identified. Other indicators can be investigated in the future in particular when monitoring potential impacts from flood overtime.

To prepare these indicators, various provincial datasets such as for land cover and crop types have been updated. Preparation of land cover and spatial crop type maps is a time and data demanding process. However, the results have been produced within a short time period (less than three weeks) with the objective to support an emergency response process using machine learning and artificial intelligence techniques that allowed integration of available datasets and complement the analysis. The results can be complemented by similar data that are being prepared by longer term national processes. It is to be noted that the quality of the data could be further improved with additional time and resources, in particular with the possibility to undertake a field data collection campaign. The results are presented in different formats (maps, tables, text) in this publication and in attached file (xls, kmz, .tiff) to maximize the possibility to use the results for different purposes e.g., at provincial level, for the Post-Disaster Needs Assessment (PDNA) among others.

The results from the remote sensing analysis have been triangulated with the national statistics and the results from other assessments such as from UNOSAT, ADB, etc. It is important to highlight that the different assessments have interesting results, and it is important to recognize they can be used for different purposes and can be complementary. It is worth mentioning here that results from remote sensing assessment are different with national datasets (such as agricultural statistics, crop area extents) because the methodological approach and the considered time period are different.

The approach followed for the impact assessment utilizes freely available data and analysis platform (e.g., GEE, SEPAL, etc.) that is mostly reproducible and leverages the use of terabytes of satellite imagery and geospatial datasets. With the objective to build on previous experience and this rapid geospatial impact assessment, it is recommended to progressively explore the development of a piloting provincial and later national agricultural monitoring system that integrates field and remote sensing. With the recent critical technological advances in geospatial technologies, it is possible to significantly increase crop monitoring efficiency and cost effectiveness. Assessment of standing crops (for the crop type impact assessment) is another area of exploration for further analysis of impact by flood. Moreover, results from different indicators can be integrated (e.g., persistent flooding, combined impact, etc.) at district level (or lower administrative level) and be used to prioritize districts / hotspots requiring immediate interventions.

Overall results revealed that land area and agricultural area flooded during August has been largely reduced in September. Therefore, specific crop cultivation can be done on available land for next crop season as long as land preparation by the farmers is feasible. All the results including flood extent, flooded agricultural area, flooded crop type area and people exposed to floods for 1 – 31 August 2022 and 1 – 19 September 2022 are provided in Excel sheet and one pager to the respective departments, divisions and organizations.

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# Annex I. Flood extent at district level using Sentinel 1 and Sentinel 2 in August 2022

Table 14. Flood extent at district level (administrative level 2) in the provinces of Sindh, Punjab, Balochistan and Khyber Pakhtunkhwa using Sentinel 1 and Sentinel 2 for the period of 1–31 August 2022

| Province            | District             | District area      | Flooded area using Sentinel1 | Flooded area percentage using Sentinel 1 | Flooded area using Sentinel 2 | Flooded area percentage using Sentinel 2 |
|---------------------|----------------------|--------------------|------------------------------|--|-------------------------------|--|
|                     |                      | (km <sup>2</sup> ) | (km <sup>2</sup> )           | %  | (km <sup>2</sup> )            | %  |
| Sindh               | Badin                | 6 570              | 2 853                        | 43.42                                    | 1 339                         | 20.39                                    |
|                     | Central Karachi      | -                  | -                            | -  | 0                             | -  |
|                     | Dadu                 | 8 016              | 2 278                        | 28.42                                    | 1 767                         | 22.05                                    |
|                     | East Karachi         | 203                | 0                            | 0.14                                     | 0                             | 0.03                                     |
|                     | Ghotki               | 6 363              | 743                          | 11.67                                    | 128                           | 2.01                                     |
|                     | Hyderabad            | 1 018              | 135                          | 13.29                                    | 30                            | 2.97                                     |
|                     | Jacobabad            | 2 689              | 2 261                        | 84.09                                    | 911                           | 33.86                                    |
|                     | Jamshoro             | 11 226             | 596                          | 5.31                                     | 614                           | 5.47                                     |
|                     | Kambar shahdad kot   | 5 595              | 3 339                        | 59.67                                    | 2 378                         | 42.51                                    |
|                     | Kashmore             | 2 613              | 1 758                        | 67.28                                    | 707                           | 27.07                                    |
|                     | Khairpur             | 5 994              | 822                          | 5.14                                     | 399                           | 2.49                                     |
|                     | Korangi Karachi      | 122                | 4                            | 3.03                                     | 1                             | 0.96                                     |
|                     | Larkana              | 1 920              | 1 248                        | 64.98                                    | 702                           | 36.55                                    |
|                     | Malir Karachi        | 2 709              | 6                            | 0.22                                     | 14                            | 0.51                                     |
|                     | Matiali              | 1 457              | 320                          | 21.97                                    | 241                           | 16.54                                    |
|                     | Mirpur khas          | 3 460              | 434                          | 12.55                                    | 120                           | 3.47                                     |
|                     | Naushahro feroze     | 3 035              | 696                          | 22.93                                    | 331                           | 10.90                                    |
|                     | Sanghar              | 10 151             | 932                          | 9.18                                     | 212                           | 2.09                                     |
|                     | Shaheed Benazir abad | 4 579              | 842                          | 18.38                                    | 412                           | 9.00                                     |
|                     | Shikarpur            | 2 550              | 1 747                        | 68.52                                    | 666                           | 26.10                                    |
|                     | South Karachi        | 508                | 2                            | 0.32                                     | 14                            | 2.69                                     |
|                     | Sujawal              | 8 682              | 1 847                        | 21.27                                    | 2 042                         | 23.52                                    |
|                     | Sukkur               | 5 175              | 694                          | 13.41                                    | 304                           | 5.87                                     |
| Tando allahyar      | 1 543                | 293                | 18.96                        | 32                                       | 2.09                          |  |
| Tando muhammad Khan | 1 676                | 809                | 48.27                        | 312                                      | 18.61                         |  |
| Tharparkar          | 19 675               | 43                 | 0.22                         | 277                                      | 1.41                          |  |

| Province | District           | District area      | Flooded area using Sentinel 1 | Flooded area percentage using Sentinel 1 | Flooded area using Sentinel 2 | Flooded area percentage using Sentinel 2 |
|----------|--------------------|--------------------|-------------------------------|--|-------------------------------|--|
|          |                    | (km <sup>2</sup> ) | (km <sup>2</sup> )            | %  | (km <sup>2</sup> )            | %  |
|          | Thatta             | 7 627              | 349                           | 4.58                                     | 728                           | 9.54                                     |
|          | Umerkot            | 5 486              | 390                           | 7.11                                     | 165                           | 3.00                                     |
|          | West Karachi       | 242                | 0                             | 0.08                                     | 2                             | 0.80                                     |
|          | <b>Total Sindh</b> | <b>140 883</b>     | <b>25 440</b>                 | <b>18.06</b>                             | <b>14 848</b>                 | <b>10.54</b>                             |
| Punjab   | sialkot            | 3 086              | 824                           | 26.71                                    | 499                           | 16.18                                    |
|          | Sheikhupura        | 3 646              | 901                           | 24.72                                    | 437                           | 11.97                                    |
|          | Gujranwala         | 3 638              | 644                           | 17.69                                    | 403                           | 11.07                                    |
|          | Narowal            | 2 393              | 335                           | 14.01                                    | 176                           | 7.36                                     |
|          | Hafizabad          | 2 286              | 318                           | 13.90                                    | 170                           | 7.46                                     |
|          | Rajanpur           | 12 578             | 1 666                         | 13.24                                    | 634                           | 5.04                                     |
|          | Nankana sahib      | 2 204              | 270                           | 12.24                                    | 126                           | 5.74                                     |
|          | Jhang              | 6 354              | 693                           | 10.91                                    | 200                           | 3.15                                     |
|          | Okara              | 4 456              | 395                           | 8.87                                     | 90                            | 2.01                                     |
|          | Mianwali           | 5 964              | 515                           | 8.63                                     | 325                           | 5.45                                     |
|          | Lahore             | 1 740              | 150                           | 8.63                                     | 55                            | 3.14                                     |
|          | Dera ghazi Khan    | 11 762             | 1 013                         | 8.61                                     | 491                           | 4.18                                     |
|          | Khushab            | 6 608              | 533                           | 8.07                                     | 67                            | 1.01                                     |
|          | Kasur              | 4 007              | 314                           | 7.84                                     | 96                            | 2.39                                     |
|          | Mandi Bahauddin    | 2 751              | 200                           | 7.26                                     | 155                           | 5.63                                     |
|          | Attock             | 6 921              | 477                           | 6.89                                     | 87                            | 1.26                                     |
|          | Multan             | 3 650              | 227                           | 6.21                                     | 126                           | 3.46                                     |
|          | Khanewal           | 4 361              | 256                           | 5.87                                     | 87                            | 2.00                                     |
|          | Muzaffargarh       | 7 689              | 395                           | 5.13                                     | 615                           | 8.00                                     |
|          | Pakpattan          | 2 894              | 134                           | 4.63                                     | 38                            | 1.33                                     |
|          | Sargodha           | 5 859              | 269                           | 4.59                                     | 114                           | 1.95                                     |
|          | Gujrat             | 3 183              | 124                           | 3.91                                     | 173                           | 5.42                                     |
|          | Lodhran            | 2 669              | 104                           | 3.90                                     | 4                             | 0.17                                     |
|          | Bahawalpur         | 23 990             | 823                           | 3.43                                     | 104                           | 0.44                                     |
|          | Sahiwal            | 3 237              | 90                            | 2.77                                     | 25                            | 0.76                                     |
|          | Bahawalnagar       | 8 602              | 221                           | 2.57                                     | 240                           | 2.79                                     |
|          | Toba tek singh     | 3 088              | 71                            | 2.30                                     | 27                            | 0.86                                     |



| Province    | District            | District area      | Flooded area using Sentinel 1 | Flooded area percentage using Sentinel 1 | Flooded area using Sentinel 2 | Flooded area percentage using Sentinel 2 |
|-------------|---------------------|--------------------|-------------------------------|--|-------------------------------|--|
|             |                     | (km <sup>2</sup> ) | (km <sup>2</sup> )            | %  | (km <sup>2</sup> )            | %  |
|             | Leiah               | 6 415              | 145                           | 2.25                                     | 211                           | 3.30                                     |
|             | Faisalabad          | 5 966              | 119                           | 1.99                                     | 53                            | 0.89                                     |
|             | Vehari              | 4 508              | 83                            | 1.85                                     | 18                            | 0.39                                     |
|             | Chiniot             | 2 608              | 47                            | 1.81                                     | 99                            | 3.80                                     |
|             | Bhakkar             | 8 478              | 133                           | 1.56                                     | 41                            | 0.49                                     |
|             | Rahim yar Khan      | 12 846             | 199                           | 1.55                                     | 277                           | 2.15                                     |
|             | Chakwal             | 6 500              | 95                            | 1.46                                     | -                             | -  |
|             | Jhelum              | 3 580              | 34                            | 0.94                                     | -                             | -  |
|             | Rawalpindi          | 5 242              | 5                             | 0.10                                     | -                             | -  |
|             | <b>Total Punjab</b> | <b>205 759</b>     | <b>12 820</b>                 | <b>6.23</b>                              | <b>6 265</b>                  | <b>3.04</b>                              |
| Balochistan | jaffarabad          | 1 701              | 1 455                         | 85.57                                    | 852                           | 50.07                                    |
|             | Sohbatpur           | 786                | 422                           | 53.68                                    | 141                           | 17.89                                    |
|             | Nasirabad           | 3 223              | 1 545                         | 47.93                                    | 1 119                         | 34.72                                    |
|             | Jhal magsi          | 3 859              | 840                           | 21.76                                    | 1 218                         | 31.56                                    |
|             | Kachhi              | 5 362              | 731                           | 13.64                                    | 662                           | 12.34                                    |
|             | Lehri               | 3 283              | 409                           | 12.46                                    | 1 289                         | 39.26                                    |
|             | Dera bugti          | 10 286             | 653                           | 6.34                                     | 25                            | 0.25                                     |
|             | Loralai             | 3 794              | 176                           | 4.64                                     | 13                            | 0.34                                     |
|             | Pishin              | 6 086              | 281                           | 4.62                                     | 243                           | 4.00                                     |
|             | Chaman              | 1 636              | 74                            | 4.51                                     | 21                            | 1.30                                     |
|             | Nushki              | 5 873              | 185                           | 3.15                                     | 233                           | 3.96                                     |
|             | Killa Abdullah      | 2 994              | 94                            | 3.14                                     | 55                            | 1.83                                     |
|             | Mastung             | 4 715              | 107                           | 2.28                                     | 80                            | 1.70                                     |
|             | Sibi                | 4 963              | 109                           | 2.20                                     | 281                           | 5.65                                     |
|             | Quetta              | 3 761              | 72                            | 1.90                                     | 28                            | 0.74                                     |
|             | Kohlu               | 7 722              | 145                           | 1.88                                     | 107                           | 1.39                                     |
|             | Kalat               | 10 184             | 168                           | 1.65                                     | 167                           | 1.64                                     |
|             | Kharan              | 8 232              | 129                           | 1.57                                     | 14                            | 0.17                                     |
|             | Barkhan             | 3 513              | 41                            | 1.15                                     | 125                           | 3.57                                     |
|             | Lasbela             | 14 066             | 134                           | 0.96                                     | 310                           | 2.20                                     |
|             | Duki                | 4 333              | 35                            | 0.82                                     | 169                           | 3.89                                     |

| Province           | District                 | District area      | Flooded area using Sentinel 1 | Flooded area percentage using Sentinel 1 | Flooded area using Sentinel 2 | Flooded area percentage using Sentinel 2 |
|--------------------|--------------------------|--------------------|-------------------------------|--|-------------------------------|--|
|                    |                          | (km <sup>2</sup> ) | (km <sup>2</sup> )            | %  | (km <sup>2</sup> )            | %  |
| Balochistan        | Ziarat                   | 3 270              | 22                            | 0.67                                     | 43                            | 1.31                                     |
|                    | Killa Saifullah          | 12 396             | 62                            | 0.50                                     | 233                           | 1.88                                     |
|                    | Harnai                   | 3 061              | 11                            | 0.37                                     | 57                            | 1.85                                     |
|                    | Khuzdar                  | 30 973             | 113                           | 0.36                                     | 298                           | 0.96                                     |
|                    | Sherani                  | 3 049              | 9                             | 0.29                                     | 55                            | 1.81                                     |
|                    | Shaheed Sikandarabad     | 3 710              | 10                            | 0.27                                     | 16                            | 0.42                                     |
|                    | Awaran                   | 25 052             | 55                            | 0.22                                     | 245                           | 0.98                                     |
|                    | Zhob                     | 11 928             | 23                            | 0.19                                     | 201                           | 1.68                                     |
|                    | Chagai                   | 44 796             | 68                            | 0.15                                     | 167                           | 0.37                                     |
|                    | Gwadar                   | 11 669             | 17                            | 0.14                                     | 234                           | 2.01                                     |
|                    | Kech                     | 24 617             | 31                            | 0.12                                     | 109                           | 0.44                                     |
|                    | Panjgur                  | 17 671             | 8                             | 0.04                                     | 70                            | 0.39                                     |
|                    | Washuk                   | 39 205             | 11                            | 0.03                                     | 104                           | 0.27                                     |
|                    | Musakhel                 | 5 897              | 1                             | 0.02                                     | 140                           | 2.37                                     |
|                    | <b>Total Balochistan</b> | <b>347 667</b>     | <b>8 247</b>                  | <b>2.37</b>                              | <b>9 122</b>                  | <b>2.62</b>                              |
| Khyber Pakhtunkhwa | lakki marwat             | 3 340              | 729                           | 21.84                                    | 73                            | 2.19                                     |
|                    | Tank                     | 2 818              | 510                           | 18.09                                    | 127                           | 4.50                                     |
|                    | D. I. Khan               | 9 027              | 1 467                         | 16.26                                    | 489                           | 5.42                                     |
|                    | Bannu                    | 2 027              | 112                           | 5.54                                     | 60                            | 2.98                                     |
|                    | Kohat                    | 3 441              | 178                           | 5.16                                     | 38                            | 1.10                                     |
|                    | Karak                    | 2 649              | 118                           | 4.45                                     | 17                            | 0.66                                     |
|                    | Swabi                    | 1 483              | 60                            | 4.02                                     | 20                            | 1.35                                     |
|                    | Chitral upper            | 8 631              | 152                           | 1.76                                     | -                             | -  |
|                    | Mohmand                  | 2 263              | 27                            | 1.21                                     | 1                             | 0.04                                     |
|                    | North waziristan         | 4 927              | 38                            | 0.78                                     | 28                            | 0.56                                     |
|                    | Haripur                  | 1 959              | 12                            | 0.61                                     | 29                            | 1.49                                     |
|                    | Nowshera                 | 1 728              | 10                            | 0.56                                     | 62                            | 3.60                                     |
|                    | Peshawar                 | 1 540              | 4                             | 0.24                                     | 3                             | 0.22                                     |
|                    | Mardan                   | 1 638              | 4                             | 0.22                                     | 97                            | 5.94                                     |
|                    | Swat                     | 5 357              | 8                             | 0.15                                     | 143                           | 2.67                                     |

| Province | District                        | District area      | Flooded area using Sentinel 1 | Flooded area percentage using Sentinel 1 | Flooded area using Sentinel 2 | Flooded area percentage using Sentinel 2 |
|----------|---------------------------------|--------------------|-------------------------------|--|-------------------------------|--|
|          |                                 | (km <sup>2</sup> ) | (km <sup>2</sup> )            | %  | (km <sup>2</sup> )            | %  |
|          | South waziristan                | 6 220              | 8                             | 0.14                                     | 47                            | 0.75                                     |
|          | Charsadda                       | 1 000              | 1                             | 0.09                                     | 14                            | 1.41                                     |
|          | Kurram                          | 3 397              | 3                             | 0.07                                     | 8                             | 0.22                                     |
|          | Kolai palas kohistan            | 1 233              | 1                             | 0.07                                     | 42                            | 3.40                                     |
|          | Kohistan upper                  | 5 501              | 3                             | 0.06                                     | 224                           | 4.07                                     |
|          | Tor ghar                        | 455                | 0                             | 0.05                                     | 3                             | 0.71                                     |
|          | Mansehra                        | 4 045              | 2                             | 0.04                                     | 62                            | 1.54                                     |
|          | Buner                           | 1 777              | 1                             | 0.04                                     | 82                            | 4.61                                     |
|          | Chitral lower                   | 6 082              | 2                             | 0.03                                     | 116                           | 1.90                                     |
|          | Hangu                           | 1 372              | 0                             | 0.03                                     | 14                            | 1.04                                     |
|          | Khyber                          | 2 748              | 1                             | 0.02                                     | 17                            | 0.63                                     |
|          | Orakzai                         | 1 370              | 0.22                          | 0.02                                     | 9                             | 0.66                                     |
|          | Bajaur                          | 1 367              | 0.16                          | 0.01                                     | 1                             | 0.10                                     |
|          | Lower dir                       | 1 606              | 0.18                          | 0.01                                     | 15                            | 0.94                                     |
|          | Upper dir                       | 3 736              | 0.36                          | 0.01                                     | 26                            | 0.70                                     |
|          | Kohistan lower                  | 825                | 0.01                          | 0.00                                     | 35                            | 4.28                                     |
|          | Malakand                        | 907                | 0.01                          | 0.00                                     | 12                            | 1.36                                     |
|          | Shangla                         | 1 387              | 0.02                          | 0.00                                     | 27                            | 1.96                                     |
|          | Batagram                        | 1 489              | 0.02                          | 0.00                                     | 15                            | 1.02                                     |
|          | Abbottabad                      | 1 645              | -                             | -  | 17                            | 1.05                                     |
|          | <b>Total Khyber Pakhtunkhwa</b> | <b>100 988</b>     | <b>3 451</b>                  | <b>3</b>                                 | <b>1 977</b>                  | <b>2</b>                                 |

Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail). Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

# Annex II. Impacted agricultural area in Pakistan in August 2022

Table 15. Impacted agriculture area in square kilometres at district level (administrative level 2) in Sindh, Punjab, KP and Balochistan using Sentinel 1 for the period of 1–31 August 2022

| Province            | District             | Tree orchard area | Flooded tree orchard area | Herbaceous crops irrigated area | Flooded irrigated crops area | Herbaceous crops rainfed area | Flooded rainfed crops area | Herbaceous crops in flood plain area | Flooded crops in flood plain area | Total agricultural area | Total flooded agricultural area | Flooded agricultural area percentage (%) |   |
|---------------------|----------------------|-------------------|---------------------------|---------------------------------|------------------------------|-------------------------------|----------------------------|--------------------------------------|-----------------------------------|-------------------------|---------------------------------|--|---|
|                     |                      | km <sup>2</sup>   | km <sup>2</sup>           | km <sup>2</sup>                 | km <sup>2</sup>              | km <sup>2</sup>               | km <sup>2</sup>            | km <sup>2</sup>                      | km <sup>2</sup>                   | km <sup>2</sup>         | km <sup>2</sup>                 |  |   |
| Sindh               | Badin                | 44                | 2                         | 4 381                           | 2 363                        | 18                            | 6                          | -                                    | -                                 | 4 443                   | 2 371                           | 53.36                                    |   |
|                     | Dadu                 | 16                | 3                         | 2 073                           | 1 546                        | 1 382                         | 357                        | 3                                    | -                                 | 3 475                   | 1 906                           | 54.86                                    |   |
|                     | Ghotki               | 52                | 4                         | 2 592                           | 569                          | -                             | -                          | -                                    | -                                 | 2 644                   | 573                             | 21.68                                    |   |
|                     | Hyderabad            | 130               | 3                         | 402                             | 92                           | 3                             | 1                          | 4                                    | 0                                 | 539                     | 95                              | 17.66                                    |   |
|                     | Jacobabad            | 1                 | 1                         | 2 056                           | 1 915                        | 3                             | 3                          | -                                    | -                                 | 2 061                   | 1 919                           | 93.12                                    |   |
|                     | Jamshoro             | 5                 | 0                         | 689                             | 338                          | 824                           | 75                         | 7                                    | 1                                 | 1 524                   | 414                             | 27.15                                    |   |
|                     | Central Karachi      |                   | -                         | -                               | -                            | -                             | -                          | -                                    | -                                 | -                       | -                               | -  | - |
|                     | East Karachi         | 0                 | -                         | 8                               | 2                            | -                             | -                          | -                                    | -                                 | 8                       | 2                               | 24.87                                    |   |
|                     | South Karachi        |                   | -                         | -                               | -                            | -                             | -                          | -                                    | -                                 | -                       | -                               | -  | - |
|                     | West Karachi         | 4                 | -                         | 27                              | 0                            | 16                            | -                          | -                                    | -                                 | 48                      | 0                               | 0.02                                     |   |
|                     | Kashmore             | 3                 | 1                         | 1 684                           | 1 297                        | -                             | -                          | 24                                   | 13                                | 1 711                   | 1 311                           | 76.65                                    |   |
|                     | Khairpur             | 515               | 18                        | 2 276                           | 553                          | 6                             | -                          | 7                                    | 2                                 | 2 804                   | 572                             | 20.41                                    |   |
|                     | Larkana              | 37                | 5                         | 1 288                           | 1 070                        | -                             | -                          | 3                                    | 1                                 | 1 329                   | 1 076                           | 80.97                                    |   |
|                     | Malir Karachi        | 5                 | -                         | 103                             | 0                            | 73                            | 0                          | -                                    | -                                 | 180                     | 0                               | 0.25                                     |   |
|                     | Matiali              | 205               | 6                         | 904                             | 247                          | 3                             | 1                          | 2                                    | 1                                 | 1 115                   | 255                             | 22.86                                    |   |
|                     | Mirpur khas          | 98                | 1                         | 1 716                           | 277                          | 8                             | 2                          | -                                    | -                                 | 1 822                   | 280                             | 15.39                                    |   |
|                     | Naushahro feroze     | 216               | 6                         | 2 022                           | 534                          | 1                             | 0                          | 5                                    | 3                                 | 2 245                   | 543                             | 24.21                                    |   |
|                     | Kambar shahdad kot   | 1                 | 1                         | 2 557                           | 2 476                        | 202                           | 78                         | -                                    | -                                 | 2 761                   | 2 555                           | 92.55                                    |   |
|                     | Sanghar              | 132               | 4                         | 3 853                           | 712                          | 43                            | 1                          | -                                    | -                                 | 4 029                   | 716                             | 17.78                                    |   |
|                     | Shaheed Benazir abad | 139               | 2                         | 2 331                           | 635                          | 6                             | 2                          | 10                                   | 3                                 | 2 486                   | 642                             | 25.84                                    |   |
|                     | Shikarpur            | 11                | 3                         | 1 776                           | 1 457                        | -                             | -                          | 1                                    | 1                                 | 1 788                   | 1 462                           | 81.72                                    |   |
|                     | Sukkur               | 142               | 5                         | 1 212                           | 398                          | -                             | -                          | 2                                    | 0                                 | 1 356                   | 403                             | 29.74                                    |   |
|                     | Tando allahyar       | 311               | 13                        | 868                             | 204                          | 4                             | 2                          | -                                    | -                                 | 1 184                   | 220                             | 18.54                                    |   |
| Tando muhammad Khan | 32                   | 1                 | 1 111                     | 619                             | 5                            | 3                             | 0                          | -                                    | 1 148                             | 623                     | 54.24                           |  |   |
| Tharparkar          | 1                    | 0                 | 154                       | 9                               | 5 712                        | 3                             | -                          | -                                    | 5 867                             | 12                      | 0.21                            |  |   |

| Province           | District             | Tree orchard area | Flooded tree orchard area | Herbaceous crops irrigated area | Flooded irrigated crops area | Herbaceous crops rainfed area | Flooded rainfed crops area | Herbaceous crops in flood plain area | Flooded crops in flood plain area | Total agricultural area | Total flooded agricultural area | Flooded agricultural area percentage (%) |
|--------------------|----------------------|-------------------|---------------------------|---------------------------------|------------------------------|-------------------------------|----------------------------|--------------------------------------|-----------------------------------|-------------------------|---------------------------------|--|
|                    |                      | km <sup>2</sup>   | km <sup>2</sup>           | km <sup>2</sup>                 | km <sup>2</sup>              | km <sup>2</sup>               | km <sup>2</sup>            | km <sup>2</sup>                      | km <sup>2</sup>                   | km <sup>2</sup>         | km <sup>2</sup>                 |  |
|                    | Sujawal              |                   |                           |                                 |                              |                               |                            |                                      |                                   |                         |                                 |  |
|                    | Thatta               | 38                | 2                         | 3 198                           | 1 153                        | 512                           | 5                          | 39                                   | 7                                 | 3 787                   | 1 166                           | 30.79                                    |
|                    | Umerkot              | 23                | 0                         | 1 603                           | 308                          | 1 004                         | 10                         | -                                    | -                                 | 2 629                   | 318                             | 12.11                                    |
|                    | <b>Total Sindh</b>   | <b>2 162</b>      | <b>81</b>                 | <b>40 885</b>                   | <b>18 773</b>                | <b>9 826</b>                  | <b>549</b>                 | <b>107</b>                           | <b>32</b>                         | <b>52 981</b>           | <b>19 436</b>                   | <b>36.68</b>                             |
| Khyber Pakhtunkhwa | Bajaur               | 0                 | -                         | 66                              | 0                            | 203                           | 0                          | 66                                   | -                                 | 336                     | 0                               | 0.01                                     |
|                    | Khyber               | 2                 | 0                         | 24                              | 0                            | 83                            | 0                          | 9                                    | 0                                 | 118                     | 0                               | 0.42                                     |
|                    | Kurram               | -                 | 0                         | 16                              | 0                            | 191                           | 0                          | 31                                   | 0                                 | 237                     | 0                               | 0.03                                     |
|                    | Mohmand              | 5                 | 26                        | 43                              | 0                            | 492                           | 26                         | 0                                    | -                                 | 540                     | 26                              | 4.81                                     |
|                    | North waziristan     | 0                 | 24                        | 3                               | 0                            | 72                            | 2                          | 80                                   | 22                                | 155                     | 24                              | 15.47                                    |
|                    | Orakzai              | -                 | 0                         | 9                               | -                            | 82                            | 0                          | 4                                    | -                                 | 96                      | 0                               | 0.23                                     |
|                    | South waziristan     | 19                | 1                         | 0                               | 0                            | 165                           | 1                          | 11                                   | -                                 | 196                     | 1                               | 0.52                                     |
|                    | Abbottabad           | 5                 | -                         | 14                              | -                            | 29                            | -                          | 14                                   | -                                 | 61                      | -                               | -  |
|                    | Bannu                | 54                | 94                        | 296                             | 10                           | 331                           | 83                         | 2                                    | 0                                 | 684                     | 94                              | 13.81                                    |
|                    | Batagram             | 0                 | -                         | 3                               | -                            | 72                            | -                          | 5                                    | -                                 | 80                      | -                               | -  |
|                    | Buner                | 3                 | 0                         | 85                              | 0                            | 240                           | 0                          | 2                                    | -                                 | 330                     | 0                               | 0.05                                     |
|                    | Charsadda            | 276               | 1                         | 414                             | 0                            | 39                            | 0                          | 9                                    | 0                                 | 738                     | 1                               | 0.12                                     |
|                    | Chitral lower        |                   |                           |                                 |                              |                               |                            |                                      |                                   |                         |                                 |  |
|                    | Chitral upper        | 0                 | 0                         | 0                               | 0                            | 150                           | 0                          | 154                                  | 0                                 | 304                     | 0                               | 0.01                                     |
|                    | D. I. Khan           | 74                | 1 270                     | 1 480                           | 161                          | 3 193                         | 1 103                      | 156                                  | 5                                 | 4 903                   | 1 270                           | 25.90                                    |
|                    | Hangu                | -                 | 0                         | 11                              | 0                            | 246                           | 0                          | 15                                   | -                                 | 272                     | 0                               | 0.12                                     |
|                    | Haripur              | 14                | 8                         | 72                              | 0                            | 220                           | 8                          | 25                                   | 0                                 | 331                     | 8                               | 2.57                                     |
|                    | Karak                | 0                 | 114                       | 14                              | 0                            | 710                           | 114                        | -                                    | -                                 | 724                     | 114                             | 15.73                                    |
|                    | Kohat                | 7                 | 165                       | 140                             | 12                           | 654                           | 153                        | 16                                   | 0                                 | 817                     | 165                             | 20.20                                    |
|                    | Kohistan lower       |                   |                           |                                 |                              |                               |                            |                                      |                                   |                         |                                 |  |
|                    | Kolai palas kohistan | 0                 | 0                         | 0                               | 0                            | 60                            | 0                          | 12                                   | 0                                 | 72                      | 0                               | 0  |
|                    | Kohistan upper       |                   |                           |                                 |                              |                               |                            |                                      |                                   |                         |                                 |  |
|                    | Lakki marwat         | 13                | 702                       | 174                             | 21                           | 1 852                         | 680                        | 6                                    | 1                                 | 2 045                   | 702                             | 34.32                                    |
|                    | Lower dir            | 0                 | 0                         | 62                              | 0                            | 89                            | 0                          | 92                                   | 0                                 | 243                     | 0                               | 0.03                                     |



| Province    | District                        | Tree orchard area | Flooded tree orchard area | Herbaceous crops irrigated area | Flooded irrigated crops area | Herbaceous crops rainfed area | Flooded rainfed crops area | Herbaceous crops in flood plain area | Flooded crops in flood plain area | Total agricultural area | Total flooded agricultural area | Flooded agricultural area percentage (%) |
|-------------|---------------------------------|-------------------|---------------------------|---------------------------------|------------------------------|-------------------------------|----------------------------|--------------------------------------|-----------------------------------|-------------------------|---------------------------------|--|
|             |                                 | km <sup>2</sup>   | km <sup>2</sup>           | km <sup>2</sup>                 | km <sup>2</sup>              | km <sup>2</sup>               | km <sup>2</sup>            | km <sup>2</sup>                      | km <sup>2</sup>                   | km <sup>2</sup>         | km <sup>2</sup>                 |  |
|             | Malakand                        | 48                | 0                         | 97                              | 0                            | 52                            | -                          | 35                                   | 0                                 | 231                     | 0                               | 0.01                                     |
|             | Mansehra                        | 7                 | 0                         | 50                              | 0                            | 137                           | -                          | 51                                   | 0                                 | 245                     | 0                               | 0.02                                     |
|             | Mardan                          | 245               | 3                         | 619                             | 2                            | 171                           | 1                          | 0                                    | -                                 | 1 035                   | 3                               | 0.33                                     |
|             | Nowshera                        | 107               | 9                         | 338                             | 4                            | 165                           | 4                          | 28                                   | 1                                 | 638                     | 9                               | 1.36                                     |
|             | Peshawar                        | 151               | 1                         | 313                             | 0                            | 163                           | 1                          | 4                                    | 0                                 | 631                     | 1                               | 0.23                                     |
|             | Shangla                         | 0                 | 0                         | 3                               | 0                            | 107                           | 0                          | 18                                   | 0                                 | 128                     | 0                               | 0.01                                     |
|             | Swabi                           | 67                | 53                        | 657                             | 44                           | 121                           | 8                          | 17                                   | 0                                 | 862                     | 53                              | 6.09                                     |
|             | Swat                            | 4                 | 1                         | 51                              | 0                            | 170                           | 0                          | 148                                  | 1                                 | 373                     | 1                               | 0.34                                     |
|             | Tank                            | -                 | 418                       | 130                             | 40                           | 791                           | 378                        | -                                    | -                                 | 922                     | 418                             | 45.39                                    |
|             | Tor ghar                        | 0                 | 0                         | 1                               | 0                            | 9                             | 0                          | 5                                    | 0                                 | 15                      | 0                               | 0.81                                     |
|             | Upper dir                       | -                 | -                         | 2                               | -                            | 91                            | -                          | 27                                   | -                                 | 120                     | -                               | -  |
|             | <b>Total Khyber Pakhtunkhwa</b> | <b>1 102</b>      | <b>2 892</b>              | <b>5 187</b>                    | <b>296</b>                   | <b>11 150</b>                 | <b>2 563</b>               | <b>1 042</b>                         | <b>31</b>                         | <b>18 481</b>           | <b>2 892</b>                    | <b>15.65</b>                             |
| Balochistan | Awaran                          | 12                | 0                         | -                               | -                            | 451                           | 24                         | -                                    | -                                 | 463                     | 24                              | 5.20                                     |
|             | BarKhan                         | 108               | 0                         | 2                               | 0                            | 568                           | 1                          | -                                    | -                                 | 678                     | 1                               | 0.12                                     |
|             | Chagai                          | 7                 | -                         | -                               | -                            | 448                           | 1                          | -                                    | -                                 | 455                     | 1                               | 0.31                                     |
|             | Dera bugti                      | 4                 | 0                         | 101                             | 34                           | 2 182                         | 59                         | -                                    | -                                 | 2 287                   | 93                              | 4.07                                     |
|             | Gwadar                          | -                 | -                         | -                               | -                            | 196                           | 0                          | -                                    | -                                 | 196                     | 0                               | 0.00                                     |
|             | Harnai                          | 31                | 0                         | 1                               | 0                            | 28                            | 0                          | -                                    | -                                 | 59                      | 0                               | 0.77                                     |
|             | Jaffarabad                      | 11                | 5                         | 2 093                           | 1 645                        | 145                           | 87                         | -                                    | -                                 | 2 248                   | 1 737                           | 77.25                                    |
|             | Jhal magsi                      | 21                | 9                         | 698                             | 372                          | 2 194                         | 66                         | -                                    | -                                 | 2 913                   | 448                             | 15.37                                    |
|             | Kachhi (bolan)                  | 6                 | 0                         | 477                             | 78                           | 2 883                         | 83                         | 63                                   | 8                                 | 3 430                   | 170                             | 4.95                                     |
|             | Shaheed Sikandarabad            | 35                | 0                         | 0                               | 0                            | 1 398                         | 0                          | 0                                    | 0                                 | 1 433                   | 0                               | 0  |
|             | Kalat                           |                   |                           |                                 |                              |                               |                            |                                      |                                   |                         |                                 |  |
|             | Kech                            | 0                 | -                         | 104                             | 0                            | 265                           | 1                          | -                                    | -                                 | 369                     | 1                               | 0.37                                     |

| Province | District                 | Tree orchard area | Flooded tree orchard area | Herbaceous crops irrigated area | Flooded irrigated crops area | Herbaceous crops rainfed area | Flooded rainfed crops area | Herbaceous crops in flood plain area | Flooded crops in flood plain area | Total agricultural area | Total flooded agricultural area | Flooded agricultural area percentage (%) |
|----------|--------------------------|-------------------|---------------------------|---------------------------------|------------------------------|-------------------------------|----------------------------|--------------------------------------|-----------------------------------|-------------------------|---------------------------------|--|
|          |                          | km <sup>2</sup>   | km <sup>2</sup>           | km <sup>2</sup>                 | km <sup>2</sup>              | km <sup>2</sup>               | km <sup>2</sup>            | km <sup>2</sup>                      | km <sup>2</sup>                   | km <sup>2</sup>         | km <sup>2</sup>                 |  |
|          | Kharan                   | -                 | -                         | -                               | -                            | 822                           | 116                        | -                                    | -                                 | 822                     | 116                             | 14.12                                    |
|          | Khuzdar                  | 73                | 0                         | 13                              | 0                            | 1 323                         | 4                          | -                                    | -                                 | 1 409                   | 4                               | 0.31                                     |
|          | Chaman                   |                   |                           |                                 |                              |                               |                            |                                      |                                   |                         |                                 |  |
|          | Killa Abdullah           | 132               | 12                        | 1                               | 0                            | 470                           | 91                         | 0                                    | 0                                 | 603                     | 103                             | 17.09                                    |
|          | Killa Saifullah          | 177               | 0                         | 2                               | -                            | 1 320                         | 0                          | -                                    | -                                 | 1 499                   | 0                               | 0.02                                     |
|          | Kohlu                    | 29                | 0                         | 17                              | 0                            | 495                           | 1                          | -                                    | -                                 | 541                     | 1                               | 0.22                                     |
|          | Lasbela                  | 176               | 4                         | 206                             | 26                           | 450                           | 29                         | 328                                  | 6                                 | 1 159                   | 65                              | 5.57                                     |
|          | Loralai                  |                   |                           |                                 |                              |                               |                            |                                      |                                   |                         |                                 |  |
|          | Duki                     | 214               | 0                         | 3                               | 0                            | 960                           | 1                          | -                                    | -                                 | 1 177                   | 1                               | 0.08                                     |
|          | Mastung                  | 128               | 6                         | 2                               | 0                            | 854                           | 101                        | -                                    | -                                 | 984                     | 107                             | 10.83                                    |
|          | Musakhel                 | 120               | 0                         | 1                               | -                            | 269                           | 0                          | -                                    | -                                 | 390                     | 0                               | 0.06                                     |
|          | Nasirabad                | 2                 | 1                         | 2 094                           | 1 481                        | 1 314                         | 140                        | -                                    | -                                 | 3 411                   | 622                             | 47.55                                    |
|          | Nushki                   | -                 | -                         | -                               | -                            | 1 001                         | 136                        | -                                    | -                                 | 1 001                   | 136                             | 13.58                                    |
|          | Panjgur                  | -                 | -                         | 81                              | 0                            | 666                           | 4                          | -                                    | -                                 | 748                     | 4                               | 0.59                                     |
|          | Pishin                   | 202               | 12                        | 2                               | 0                            | 617                           | 82                         | -                                    | -                                 | 821                     | 95                              | 11.60                                    |
|          | Quetta                   | 48                | 3                         | 1                               | 0                            | 265                           | 32                         | -                                    | -                                 | 314                     | 35                              | 11.26                                    |
|          | Sherani                  | 31                | 0                         | 0                               | 0                            | 48                            | 1                          | -                                    | -                                 | 79                      | 1                               | 0.82                                     |
|          | Lehri                    | -                 | -                         | -                               | -                            | -                             | -                          | -                                    | -                                 | -                       | -                               | -  |
|          | Sibi                     | 38                | 0                         | 437                             | 27                           | 2 089                         | 145                        | 55                                   | 6                                 | 2 618                   | 178                             | 6.79                                     |
|          | Sohbatpur                | -                 | -                         | -                               | -                            | -                             | -                          | -                                    | -                                 | -                       | -                               | -  |
|          | Washuk                   | -                 | -                         | -                               | -                            | -                             | -                          | -                                    | -                                 | -                       | -                               | -  |
|          | Zhob                     | 85                | 0                         | 0                               | 0                            | 901                           | 1                          | 2                                    | 0                                 | 989                     | 1                               | 0.12                                     |
|          | Ziarat                   | 101               | 0                         | 3                               | -                            | 41                            | 0                          | -                                    | -                                 | 145                     | 0                               | 0.04                                     |
|          | <b>Total Balochistan</b> | <b>1 789</b>      | <b>53</b>                 | <b>6 340</b>                    | <b>3 664</b>                 | <b>24 663</b>                 | <b>1 232</b>               | <b>448</b>                           | <b>20</b>                         | <b>33 241</b>           | <b>4 969</b>                    | <b>14.95</b>                             |
| Punjab   | Attock                   | 1                 | 0                         | 0                               | 0                            | 3 630                         | 442                        | -                                    | -                                 | 3 631                   | 442                             | 12.18                                    |

| Province | District        | Tree orchard area | Flooded tree orchard area | Herbaceous crops irrigated area | Flooded irrigated crops area | Herbaceous crops rainfed area | Flooded rainfed crops area | Herbaceous crops in flood plain area | Flooded crops in flood plain area | Total agricultural area | Total flooded agricultural area | Flooded agricultural area percentage (%) |
|----------|-----------------|-------------------|---------------------------|---------------------------------|------------------------------|-------------------------------|----------------------------|--------------------------------------|-----------------------------------|-------------------------|---------------------------------|--|
|          |                 | km <sup>2</sup>   | km <sup>2</sup>           | km <sup>2</sup>                 | km <sup>2</sup>              | km <sup>2</sup>               | km <sup>2</sup>            | km <sup>2</sup>                      | km <sup>2</sup>                   | km <sup>2</sup>         | km <sup>2</sup>                 |  |
|          | Bahawalnagar    | 14                | 0                         | 5 860                           | 181                          | 435                           | 22                         | 136                                  | 1                                 | 6 445                   | 204                             | 3.17                                     |
|          | Bahawalpur      | 42                | 0                         | 5 795                           | 537                          | 81                            | 2                          | 15                                   | 0                                 | 5 933                   | 540                             | 9.11                                     |
|          | Bhakkar         | 178               | 1                         | 3 642                           | 33                           | 46                            | 1                          | 61                                   | 0                                 | 3 927                   | 35                              | 0.90                                     |
|          | Chakwal         | 0                 | -                         | 0                               | 0                            | 3 522                         | 105                        | -                                    | -                                 | 3 522                   | 105                             | 2.97                                     |
|          | Chiniot         | 179               | 2                         | 1 997                           | 41                           | 76                            | 2                          | 113                                  | 0                                 | 2 364                   | 45                              | 1.90                                     |
|          | Dera ghazi Khan | 52                | 3                         | 2 866                           | 519                          | 1 731                         | 383                        | 352                                  | 32                                | 5 000                   | 937                             | 18.74                                    |
|          | Faisalabad      | 290               | 0                         | 4 484                           | 69                           | 411                           | 3                          | 8                                    | 0                                 | 5 193                   | 73                              | 1.41                                     |
|          | Gujranwala      | 17                | 0                         | 1 822                           | 525                          | 1 284                         | 125                        | 26                                   | 1                                 | 3 149                   | 651                             | 20.67                                    |
|          | Gujrat          | 18                | 0                         | 209                             | 81                           | 1 986                         | 53                         | 28                                   | -                                 | 2 241                   | 134                             | 5.98                                     |
|          | Hafizabad       | 7                 | 0                         | 2 023                           | 313                          | 81                            | 5                          | 13                                   | 1                                 | 2 124                   | 319                             | 15.03                                    |
|          | Jhang           | 99                | 5                         | 3 895                           | 566                          | 248                           | 33                         | 241                                  | 26                                | 4 483                   | 631                             | 14.07                                    |
|          | Jhelum          | 26                | 1                         | 176                             | 12                           | 1 121                         | 19                         | 51                                   | 0                                 | 1 374                   | 32                              | 2.32                                     |
|          | Kasur           | 63                | 0                         | 3 348                           | 258                          | 108                           | 10                         | 51                                   | 3                                 | 3 570                   | 271                             | 7.58                                     |
|          | Khanewal        | 152               | 2                         | 3 526                           | 225                          | 3                             | 0                          | 81                                   | 11                                | 3 762                   | 237                             | 6.30                                     |
|          | Khushab         | 165               | 8                         | 2 048                           | 362                          | 623                           | 99                         | 73                                   | 8                                 | 2 910                   | 476                             | 16.37                                    |
|          | Lahore          | 17                | 0                         | 949                             | 83                           | 52                            | 1                          | 1                                    | 0                                 | 1 019                   | 84                              | 8.24                                     |
|          | Layyah          | 98                | 1                         | 3 240                           | 37                           | 15                            | 0                          | 368                                  | 36                                | 3 722                   | 74                              | 2.00                                     |
|          | Lodhran         | 12                | 0                         | 2 590                           | 104                          | 107                           | 5                          | 8                                    | -                                 | 2 718                   | 109                             | 4.00                                     |
|          | Mandi Bahauddin | 127               | 1                         | 1 164                           | 143                          | 967                           | 37                         | 40                                   | 4                                 | 2 298                   | 184                             | 8.01                                     |
|          | Mianwali        | 65                | 2                         | 1 342                           | 82                           | 1 785                         | 274                        | 221                                  | 31                                | 3 413                   | 388                             | 11.38                                    |
|          | Multan          | 333               | 4                         | 2 514                           | 140                          | 183                           | 29                         | 80                                   | 22                                | 3 111                   | 196                             | 6.29                                     |
|          | Muzaffargarh    | 345               | 1                         | 5 080                           | 210                          | 327                           | 42                         | 457                                  | 50                                | 6 209                   | 304                             | 4.90                                     |
|          | Nankana sahib   | 33                | 0                         | 1 427                           | 229                          | 44                            | 4                          | 24                                   | 2                                 | 1 527                   | 235                             | 15.40                                    |
|          | Narowal         | 2                 | 0                         | 719                             | 176                          | 1 261                         | 96                         | 157                                  | 26                                | 2 139                   | 299                             | 13.96                                    |

| Province | District            | Tree orchard area | Flooded tree orchard area | Herbaceous crops irrigated area | Flooded irrigated crops area | Herbaceous crops rainfed area | Flooded rainfed crops area | Herbaceous crops in flood plain area | Flooded crops in flood plain area | Total agricultural area | Total flooded agricultural area | Flooded agricultural area percentage (%) |
|----------|---------------------|-------------------|---------------------------|---------------------------------|------------------------------|-------------------------------|----------------------------|--------------------------------------|-----------------------------------|-------------------------|---------------------------------|--|
|          |                     | km <sup>2</sup>   | km <sup>2</sup>           | km <sup>2</sup>                 | km <sup>2</sup>              | km <sup>2</sup>               | km <sup>2</sup>            | km <sup>2</sup>                      | km <sup>2</sup>                   | km <sup>2</sup>         | km <sup>2</sup>                 |  |
|          | Okara               | 23                | 0                         | 3 738                           | 364                          | 176                           | 6                          | 64                                   | 0                                 | 4 002                   | 370                             | 9.25                                     |
|          | Pakpattan           | 10                | 0                         | 2 384                           | 136                          | 87                            | 1                          | 28                                   | 0                                 | 2 509                   | 138                             | 5.48                                     |
|          | Rahim yar Khan      | 243               | 1                         | 6 073                           | 98                           | 112                           | 9                          | 109                                  | 15                                | 6 537                   | 122                             | 1.87                                     |
|          | Rajanpur            | 35                | 1                         | 3 240                           | 431                          | 2 139                         | 675                        | 11                                   | 4                                 | 5 425                   | 111                             | 20.47                                    |
|          | Rawalpindi          | 0                 | -                         | 0                               | -                            | 1 845                         | 2                          | -                                    | -                                 | 1 845                   | 2                               | 0.12                                     |
|          | Sahiwal             | 51                | 0                         | 2 637                           | 84                           | 147                           | 3                          | 12                                   | 1                                 | 2 847                   | 88                              | 3.08                                     |
|          | Sargodha            | 1 581             | 10                        | 3 195                           | 193                          | 310                           | 53                         | 62                                   | 0                                 | 5 147                   | 256                             | 4.97                                     |
|          | Sheikhupura         | 112               | 1                         | 3 403                           | 901                          | 361                           | 46                         | 8                                    | 0                                 | 3 884                   | 948                             | 24.41                                    |
|          | Sialkot             | 14                | 0                         | 949                             | 468                          | 1 630                         | 321                        | 29                                   | 1                                 | 2 622                   | 791                             | 30.16                                    |
|          | Toba tek singh      | 98                | 1                         | 2 600                           | 76                           | 144                           | 3                          | 18                                   | 1                                 | 2 860                   | 80                              | 2.81                                     |
|          | Vehari              | 42                | 0                         | 3 833                           | 76                           | 162                           | 1                          | 12                                   | 0                                 | 4 049                   | 78                              | 1.91                                     |
|          | <b>Total Punjab</b> | <b>4 546</b>      | <b>47</b>                 | <b>92 766</b>                   | <b>7 753</b>                 | <b>27 240</b>                 | <b>2 912</b>               | <b>2 960</b>                         | <b>277</b>                        | <b>127 511</b>          | <b>10 989</b>                   | <b>8.62</b>                              |

Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).

Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>



## Annex III. Impacted crop type area in Sindh in August 2022

Table 16. Flooded rice crop area, cotton crop area, sugarcane crop area, and potential wheat cultivation area at district level (administrative level 2) in Sindh using Sentinel 1 during 1–31 August 2022

| ID | Districts          | Cotton crop area | Flooded cotton crop area | Flooded cotton crop area percentage | Sugarcane crop area | Flooded sugarcane crop area | Flooded sugarcane crop area percentage | Rice crop area  | Flooded rice crop area | Flooded rice crop area percentage | Potential area for wheat cultivation | Flooded potential area for wheat crop cultivation | Flooded wheat crop area percentage |
|----|--------------------|------------------|--------------------------|-------------------------------------|---------------------|-----------------------------|--|-----------------|------------------------|-----------------------------------|--------------------------------------|---|------------------------------------|
|    |                    | km <sup>2</sup>  | km <sup>2</sup>          | %                                   | km <sup>2</sup>     | km <sup>2</sup>             | %                                      | km <sup>2</sup> | km <sup>2</sup>        | %                                 | km <sup>2</sup>                      | km <sup>2</sup>                                   | %                                  |
| 1  | Central Karachi    | -                | -                        | -                                   | -                   | -                           | -                                      | -               | -                      | -                                 | -                                    | -   | 0.0                                |
| 2  | Dadu               | 139              | 49                       | 35                                  | 58                  | 15                          | 25                                     | 752             | 534                    | 71                                | 646                                  | 441   | 68.3                               |
| 3  | South Karachi      | -                | -                        | -                                   | -                   | -                           | -                                      | 2               | -                      | -                                 | -                                    | -   | 0.0                                |
| 4  | Sujawal            | 0                | 0                        | 39                                  | 182                 | 24                          | 13                                     | 891             | 472                    | 53                                | 76                                   | 42  | 55.7                               |
| 5  | Sukkur             | 198              | 23                       | 11                                  | 60                  | 3                           | 6                                      | 200             | 88                     | 44                                | 413                                  | 151   | 36.5                               |
| 6  | West Karachi       | -                | -                        | -                                   | -                   | -                           | -                                      | 2               | 0                      | 0                                 | 0                                    | -   | 0.0                                |
| 7  | East Karachi       | -                | -                        | -                                   | -                   | -                           | -                                      | 1               | 0                      | 1                                 | 0                                    | -   | 0.0                                |
| 8  | Ghotki             | 148              | 5                        | 3                                   | 270                 | 6                           | 2                                      | 603             | 176                    | 29                                | 582                                  | 125   | 21.5                               |
| 9  | Korangi Karachi    | -                | -                        | -                                   | -                   | -                           | -                                      | 1               | 0                      | 18                                | 1                                    | 0   | 22.1                               |
| 10 | Larkana            | 67               | 34                       | 51                                  | 15                  | 5                           | 36                                     | 435             | 400                    | 92                                | 468                                  | 433   | 92.5                               |
| 11 | Malir Karachi      | -                | -                        | -                                   | -                   | -                           | -                                      | 45              | 0                      | 0                                 | 3                                    | 0   | 0.5                                |
| 12 | Badin              | 235              | 27                       | 12                                  | 272                 | 64                          | 23                                     | 2 016           | 1 360                  | 67                                | 190                                  | 103   | 54.1                               |
| 13 | Hyderabad          | 151              | 22                       | 15                                  | 50                  | 5                           | 9                                      | 66              | 25                     | 39                                | 60                                   | 9   | 14.9                               |
| 14 | Jacobabad          | -                | -                        | -                                   | 0                   | 0                           | 100                                    | 899             | 837                    | 93                                | 321                                  | 298   | 92.8                               |
| 15 | Jamshoro           | 106              | 22                       | 21                                  | 10                  | 2                           | 18                                     | 257             | 95                     | 37                                | 140                                  | 72  | 51.3                               |
| 16 | Kambar shahdad kot | -                | -                        | -                                   | -                   | -                           | -                                      | 879             | 855                    | 97                                | 831                                  | 812   | 97.8                               |
| 17 | Kashmore           | 0                | 0                        | 28                                  | 13                  | 1                           | 10                                     | 484             | 438                    | 91                                | 453                                  | 414   | 91.4                               |
| 18 | Khairpur           | 914              | 106                      | 12                                  | 230                 | 21                          | 9                                      | 345             | 107                    | 31                                | 720                                  | 178   | 24.7                               |
| 19 | Matiari            | 379              | 42                       | 11                                  | 112                 | 13                          | 12                                     | 136             | 53                     | 39                                | 338                                  | 81  | 24.1                               |
| 20 | Mirpur khas        | 583              | 44                       | 8                                   | 234                 | 11                          | 5                                      | 332             | 73                     | 22                                | -                                    | 16  | 0.0                                |

| ID           | Districts            | Cotton crop area | Flooded cotton crop area | Flooded cotton crop area percentage | Sugarcane crop area | Flooded sugarcane crop area | Flooded sugarcane crop area percentage | Rice crop area  | Flooded rice crop area | Flooded rice crop area percentage | Potential area for wheat cultivation | Flooded potential area for wheat crop cultivation | Flooded wheat crop area percentage |
|--------------|----------------------|------------------|--------------------------|-------------------------------------|---------------------|-----------------------------|--|-----------------|------------------------|-----------------------------------|--------------------------------------|---|------------------------------------|
|              |                      | km <sup>2</sup>  | km <sup>2</sup>          | %                                   | km <sup>2</sup>     | km <sup>2</sup>             | %                                      | km <sup>2</sup> | km <sup>2</sup>        | %                                 | km <sup>2</sup>                      | km <sup>2</sup>                                   | %                                  |
| 21           | Naushahro feroze     | 938              | 166                      | 18                                  | 272                 | 21                          | 8                                      | 315             | 134                    | 42                                | 609                                  | 156   | 25.6                               |
| 22           | Sanghar              | 1 927            | 237                      | 12                                  | 158                 | 21                          | 13                                     | 365             | 91                     | 25                                | 643                                  | 71  | 11.0                               |
| 23           | Shaheed Benazir abad | 683              | 105                      | 15                                  | 367                 | 51                          | 14                                     | 341             | 131                    | 38                                | 650                                  | 162   | 24.9                               |
| 24           | Shikarpur            | 0                | 0                        | 60                                  | 2                   | 1                           | 74                                     | 645             | 549                    | 85                                | 446                                  | 382   | 85.7                               |
| 25           | Tando allahyar       | 423              | 84                       | 20                                  | 206                 | 21                          | 10                                     | 79              | 24                     | 30                                | 180                                  | 27  | 15.1                               |
| 26           | Tando muhammad Khan  | 28               | 5                        | 17                                  | 243                 | 55                          | 23                                     | 527             | 374                    | 71                                | 64                                   | 30  | 46.2                               |
| 27           | Tharparkar           | 2                | 0                        | 2                                   | 0                   | -                           | 0                                      | 204             | 6                      | 3                                 | 16                                   | 1   | 8.9                                |
| 28           | Thatta               | 12               | 0                        | 0                                   | 243                 | 20                          | 8                                      | 599             | 106                    | 18                                | 29                                   | 4   | 13.0                               |
| 29           | Umerkot              | 704              | 77                       | 11                                  | 20                  | 2                           | 7                                      | 479             | 114                    | 24                                | 197                                  | 33  | 16.6                               |
| <b>Total</b> |                      | <b>7 637</b>     | <b>1 048</b>             | <b>14</b>                           | <b>3 016</b>        | <b>361</b>                  | <b>12</b>                              | <b>11 900</b>   | <b>7 043</b>           | <b>59</b>                         | <b>8 077</b>                         | <b>4 041</b>                                      | <b>50.0</b>                        |

Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).

Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

## Annex IV. Impacted crop type area in Khyber Pakhtunkhwa in August 2022

Table 17. Flooded rice crop area, cotton crop area, sugarcane crop area, and potential wheat cultivation area at district level (administrative level 2) in Khyber Pakhtunkhwa using Sentinel 1 during 1–31 August 2022

| ID | Districts        | Cotton crop area | Flooded cotton crop area | Flooded cotton crop area percentage | Sugarcane crop area | Flooded sugarcane crop area | Flooded sugarcane crop area percentage | Rice crop area  | Flooded rice crop area | Flooded rice crop area percentage | Potential area for wheat cultivation | Flooded potential area for wheat crop cultivation | Flooded wheat crop area percentage |
|----|------------------|------------------|--------------------------|-------------------------------------|---------------------|-----------------------------|--|-----------------|------------------------|-----------------------------------|--------------------------------------|---|------------------------------------|
|    |                  | km <sup>2</sup>  | km <sup>2</sup>          | %                                   | km <sup>2</sup>     | km <sup>2</sup>             | %                                      | km <sup>2</sup> | km <sup>2</sup>        | %                                 | km <sup>2</sup>                      | km <sup>2</sup>                                   | %                                  |
| 1  | Mohmand          | 5.2147           | 0.016                    | 0.30682                             | 1.2                 | 0                           | 0.00                                   | 468             | 1                      | 0.29                              | 18                                   | 0.1394  | 0.79                               |
| 2  | North waziristan | 0.4122           | 0.0174                   | 4.22125                             | 3.4                 | 0.1033                      | 3.05                                   | 923             | 151                    | 16.40                             | 8                                    | 0.8627  | 10.19                              |
| 3  | Orakzai          | 0.0205           | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 92              | -                      | 0.00                              | 18                                   | 0   | -                                  |
| 4  | South waziristan | 1.7192           | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 451             | 0                      | 0.03                              | 7                                    | 0.0831  | 1.17                               |
| 5  | Lakki marwat     | 0.1752           | 0.0049                   | 2.7968                              | 2.7                 | 0.0384                      | 1.45                                   | 3 486           | 232                    | 6.65                              | 30                                   | 6.0116  | 19.94                              |
| 6  | Mardan           | 29.6882          | 0.0796                   | 0.26812                             | 238.6               | 0.0825                      | 0.03                                   | 3 553           | 5                      | 0.13                              | 110                                  | 0.5226  | 0.48                               |
| 7  | Nowshera         | 25.4827          | 0.0623                   | 0.24448                             | 40.0                | 0.08                        | 0.20                                   | 2 051           | 3                      | 0.13                              | 53                                   | 0.2737  | 0.52                               |
| 8  | Peshawar         | 0.9988           | 0                        | 0                                   | 29.4                | 0.0023                      | 0.01                                   | 1 468           | 6                      | 0.39                              | 35                                   | 0.0773  | 0.22                               |
| 9  | Shangla          | 0                | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 56              | -                      | 0.00                              | 48                                   | 0.0004  | 0.00                               |
| 10 | Swabi            | 0.9907           | 0                        | 0                                   | 91.8                | 1.2203                      | 1.33                                   | 8 956           | 103                    | 1.15                              | 142                                  | 4.5031  | 3.17                               |
| 11 | Swat             | 0.0021           | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 401             | 0                      | 0.04                              | 97                                   | 0.0093  | 0.01                               |
| 12 | Tank             | 20.0661          | 4.8107                   | 23.9743                             | 0.0                 | 0                           | 0.00                                   | 1 925           | 509                    | 26.41                             | 18                                   | 5.5722  | 30.13                              |
| 13 | Bajaur           | 0.8664           | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 911             | 0                      | 0.01                              | 25                                   | 0   | -                                  |
| 14 | Khyber           | 0                | 0                        | 0                                   | 3.3                 | 0                           | 0.00                                   | 210             | 0                      | 0.07                              | 18                                   | 0.1765  | 0.97                               |
| 15 | Kurram           | 0                | 0                        | 0                                   | 0.4                 | 0.0014                      | 0.36                                   | 370             | 1                      | 0.14                              | 17                                   | 0   | -                                  |
| 16 | Abbottabad       | 0                | 0                        | 0                                   | 0.0                 | 0.0319                      | 0.00                                   | 100             | -                      | 0.00                              | 40                                   | 0   | -                                  |
| 17 | Bannu            | 0.0339           | 0                        | 0                                   | 3.2                 | 0.0319                      | 1.01                                   | 6 626           | 142                    | 2.14                              | 29                                   | 1.0215  | 3.50                               |
| 18 | Batagram         | 0                | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 44              | -                      | 0.00                              | 40                                   | 0   | -                                  |
| 19 | Buner            | 0                | 0                        | 0                                   | 21.2                | 0.0092                      | 0.04                                   | 1 623           | 2                      | 0.12                              | 55                                   | 0.034   | 0.06                               |
| 20 | Charsadda        | 45.4221          | 0.0463                   | 0.10193                             | 182.0               | 0.0333                      | 0.02                                   | 858             | 0                      | 0.01                              | 45                                   | 0.0751  | 0.17                               |
| 21 | Chitral upper    | 0                | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 46              | -                      | 0.00                              | 1                                    | 0   | -                                  |
| 22 | D. I. Khan       | 724.6991         | 55.1569                  | 7.61101                             | 0.0                 | 0                           | 0.00                                   | 10 396          | 1 206                  | 11.60                             | 141                                  | 30.1705   | 21.39                              |
| 23 | Hangu            | 0                | 0                        | 0                                   | 14.9                | 0                           | 0.00                                   | 301             | 1                      | 0.20                              | 5                                    | 0.0071  | 0.14                               |
| 24 | Haripur          | 0                | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 4 111           | 63                     | 1.53                              | 63                                   | 3.2606  | 5.21                               |
| 25 | Karak            | 5.0882           | 0.0138                   | 0.27122                             | 0.7                 | 0.0006                      | 0.08                                   | 328             | 2                      | 0.51                              | 6                                    | 0.2906  | 4.87                               |
| 26 | Kohat            | 34.5226          | 0.7225                   | 2.09283                             | 7.6                 | 0.0225                      | 0.30                                   | 3 003           | 73                     | 2.44                              | 40                                   | 3.6379  | 9.10                               |
| 27 | Kohistan upper   | 0                | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 1               | -                      | 0.00                              | 58                                   | 0   | -                                  |
| 28 | Lower dir        | 0                | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 924             | 0                      | 0.05                              | 21                                   | 0   | -                                  |

| ID | Districts            | Cotton crop area | Flooded cotton crop area | Flooded cotton crop area percentage | Sugarcane crop area | Flooded sugarcane crop area | Flooded sugarcane crop area percentage | Rice crop area  | Flooded rice crop area | Flooded rice crop area percentage | Potential area for wheat cultivation | Flooded potential area for wheat crop cultivation | Flooded wheat crop area percentage |
|----|----------------------|------------------|--------------------------|-------------------------------------|---------------------|-----------------------------|--|-----------------|------------------------|-----------------------------------|--------------------------------------|---|------------------------------------|
|    |                      | km <sup>2</sup>  | km <sup>2</sup>          | %                                   | km <sup>2</sup>     | km <sup>2</sup>             | %                                      | km <sup>2</sup> | km <sup>2</sup>        | %                                 | km <sup>2</sup>                      | km <sup>2</sup>                                   | %                                  |
| 29 | Malakand             | 0.2594           | 0                        | 0                                   | 50.8                | 0                           | 0.00                                   | 405             | -                      | 0.00                              | 22                                   | 0   | -                                  |
| 30 | Mansehra             | 0                | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 995             | 0                      | 0.02                              | 73                                   | 0.2246  | 0.31                               |
| 31 | Tor ghar             | 0                | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 26              | 0                      | 0.39                              | 39                                   | 0.0253  | 0.07                               |
| 32 | Upper dir            | 0                | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 85              | -                      | 0.00                              | 68                                   | 0   | -                                  |
| 33 | Kohistan lower       | 0                | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 1               | -                      | 0.00                              | 16                                   | 0   | -                                  |
| 34 | Kolai palas kohistan | 0                | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 1               | -                      | 0.00                              | 37                                   | 0   | -                                  |
| 35 | Chitral lower        | 0                | 0                        | 0                                   | 0.0                 | 0                           | 0.00                                   | 46              | -                      | 0.00                              | 26                                   | 0   | -                                  |
|    | <b>Total</b>         | <b>895.6621</b>  | <b>60.9304</b>           | <b>6.80283</b>                      | <b>691.0</b>        | <b>1.6576</b>               | <b>0.24</b>                            | <b>55 246</b>   | <b>2 500</b>           | <b>4.52</b>                       | <b>1 470</b>                         | <b>57</b>   | <b>3.88</b>                        |

Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).

Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

## Annex V. Impacted crop type area in Balochistan in August 2022

Table 18. Flooded rice crop area, cotton crop area, sugarcane crop area, and potential wheat cultivation area at district level (administrative level 2) in Balochistan using Sentinel 1 during 1–31 August 2022

| ID | Districts  | Cotton crop area | Flooded cotton crop area | Flooded cotton crop area percentage | Sugarcane crop area | Flooded sugarcane crop area | Flooded sugarcane crop area percentage | Rice crop area  | Flooded rice crop area | Flooded rice crop area percentage | Potential area for wheat cultivation | Flooded potential area for wheat crop cultivation | Flooded wheat crop area percentage |
|----|------------|------------------|--------------------------|-------------------------------------|---------------------|-----------------------------|--|-----------------|------------------------|-----------------------------------|--------------------------------------|---|------------------------------------|
|    |            | km <sup>2</sup>  | km <sup>2</sup>          | %                                   | km <sup>2</sup>     | km <sup>2</sup>             | %                                      | km <sup>2</sup> | km <sup>2</sup>        | %                                 | km <sup>2</sup>                      | km <sup>2</sup>                                   | %                                  |
| 1  | Dera bugti | 35.51            | 0.07                     | 0.21                                | 0.37                | -                           | -                                      | 28.16           | 4.31                   | 15.30                             | 23.46                                | 6.89  | 29.37                              |
| 2  | Gwadar     | -                | -                        | -                                   | -                   | -                           | -                                      | 1.23            | -                      | -                                 | 0.00                                 | 0.00  | 0.00                               |
| 3  | Harnai     | 144.12           | 0.00                     | 0.00                                | 9.22                | -                           | -                                      | 20.75           | 0.01                   | 0.06                              | 5.98                                 | 0.06  | 0.97                               |
| 4  | Sohbatpur  | -                | -                        | -                                   | -                   | -                           | -                                      | 208.33          | 100.92                 | 48.44                             | 0.02                                 | 0.00  | 15.38                              |
| 5  | Jaffarabad | 1.20             | 1.19                     | 99.26                               | -                   | -                           | -                                      | 237.79          | 192.57                 | 80.98                             | 0.10                                 | 0.05  | 49.53                              |
| 6  | Washuk     | 4.49             | 0.10                     | 2.26                                | -                   | -                           | -                                      | 0.66            | -                      | -                                 | 0.00                                 | 0.00  | 0.00                               |
| 7  | Zhob       | 15.09            | 0.01                     | 0.06                                | 1.11                | -                           | -                                      | 14.61           | 0.02                   | 0.11                              | 49.73                                | 0.00  | 0.00                               |
| 8  | Duki       | 232.09           | 0.19                     | 0.08                                | 23.26               | 0.00                        | 0.01                                   | 14.97           | 0.01                   | 0.08                              | 8.66                                 | 0.01  | 0.14                               |
| 9  | Mastung    | 61.07            | 3.57                     | 5.84                                | -                   | -                           | -                                      | 1.07            | 0.03                   | 3.20                              | 0.00                                 | 0.00  | 100.00                             |
| 10 | Musakhel   | 149.18           | 0.00                     | 0.00                                | 14.06               | -                           | -                                      | 48.69           | 0.00                   | 0.01                              | 24.35                                | 0.00  | 0.02                               |
| 11 | Ziarat     | 53.00            | 0.01                     | 0.01                                | 25.74               | -                           | -                                      | 6.52            | -                      | -                                 | 5.11                                 | 0.00  | 0.00                               |
| 12 | Awaran     | 80.14            | 0.23                     | 0.29                                | -                   | -                           | -                                      | 4.07            | 0.07                   | 1.74                              | 0.00                                 | 0.00  | 0.00                               |
| 13 | BarKhan    | 367.04           | 0.62                     | 0.17                                | 34.21               | 0.01                        | 0.03                                   | 42.08           | 0.03                   | 0.07                              | 24.77                                | 0.03  | 0.11                               |
| 14 | Chagai     | 84.70            | 0.12                     | 0.14                                | -                   | -                           | -                                      | 0.43            | -                      | -                                 | 0.00                                 | 0.00  | 0.00                               |
| 15 | Jhal magsi | 58.65            | 24.95                    | 42.54                               | -                   | -                           | -                                      | 7.34            | 5.59                   | 76.15                             | 0.02                                 | 0.02  | 79.00                              |
| 16 | Kachhi     | 0.25             | 0.00                     | 1.82                                | -                   | -                           | -                                      | 1.04            | 0.04                   | 3.60                              | 52.98                                | 10.04   | 18.96                              |
| 17 | Kalat      | 48.01            | 0.31                     | 0.64                                | -                   | -                           | -                                      | 2.99            | 0.00                   | 0.03                              | 0.00                                 | 0.00  | 0.00                               |
| 18 | Kech       | -                | -                        | -                                   | -                   | -                           | -                                      | 5.93            | 0.00                   | 0.00                              | 0.00                                 | 0.00  | 0.00                               |
| 19 | Kharan     | 61.57            | 10.70                    | 17.38                               | -                   | -                           | -                                      | 0.15            | 0.01                   | 3.86                              | 0.00                                 | 0.00  | 0.00                               |



| ID           | Districts            | Cotton crop area | Flooded cotton crop area | Flooded cotton crop area percentage | Sugarcane crop area | Flooded sugarcane crop area | Flooded sugarcane crop area percentage | Rice crop area  | Flooded rice crop area | Flooded rice crop area percentage | Potential area for wheat cultivation | Flooded potential area for wheat crop cultivation | Flooded wheat crop area percentage |
|--------------|----------------------|------------------|--------------------------|-------------------------------------|---------------------|-----------------------------|--|-----------------|------------------------|-----------------------------------|--------------------------------------|---|------------------------------------|
|              |                      | km <sup>2</sup>  | km <sup>2</sup>          | %                                   | km <sup>2</sup>     | km <sup>2</sup>             | %                                      | km <sup>2</sup> | km <sup>2</sup>        | %                                 | km <sup>2</sup>                      | km <sup>2</sup>                                   | %                                  |
| 20           | Khuzdar              | 285.01           | 0.56                     | 0.20                                | -                   | -                           | -                                      | 46.09           | 0.19                   | 0.42                              | 0.00                                 | 0.00  | 0.00                               |
| 21           | Killa Abdullah       | 37.27            | 6.14                     | 16.46                               | -                   | -                           | -                                      | 0.49            | 0.05                   | 10.18                             | 0.00                                 | 0.00  | 0.00                               |
| 22           | Killa Saifullah      | 21.95            | -                        | -                                   | -                   | -                           | -                                      | 13.91           | 0.00                   | 0.00                              | 47.22                                | 0.01  | 0.02                               |
| 23           | Kohlu                | 155.75           | 0.20                     | 0.13                                | 10.37               | 0.01                        | 0.11                                   | 8.33            | 0.02                   | 0.18                              | 13.95                                | 0.15  | 1.05                               |
| 24           | Lasbela              | 414.67           | 12.73                    | 3.07                                | -                   | -                           | -                                      | 121.98          | 1.83                   | 1.50                              | 0.00                                 | 0.00  | 0.00                               |
| 25           | Lehri                | -                | -                        | -                                   | -                   | -                           | -                                      | 0.22            | 0.06                   | 25.98                             | 16.27                                | 6.38  | 39.19                              |
| 26           | Nasirabad            | 2.64             | 2.33                     | 88.40                               | -                   | -                           | -                                      | 358.83          | 199.74                 | 55.66                             | 255.85                               | 173.89  | 67.96                              |
| 27           | Nushki               | 49.82            | 2.40                     | 4.81                                | -                   | -                           | -                                      | 0.07            | 0.00                   | 0.29                              | 0.00                                 | 0.00  | 0.00                               |
| 28           | Pishin               | 78.19            | 5.32                     | 6.80                                | -                   | -                           | -                                      | 2.40            | 0.06                   | 2.44                              | 0.00                                 | 0.00  | 0.00                               |
| 29           | Quetta               | 14.70            | 0.78                     | 5.28                                | -                   | -                           | -                                      | 1.51            | 0.01                   | 0.37                              | 0.01                                 | 0.00  | 0.00                               |
| 30           | Sherani              | -                | -                        | -                                   | -                   | -                           | -                                      | 5.53            | 0.05                   | 0.87                              | 22.71                                | 0.07  | 0.33                               |
| 31           | Sibi                 | 65.63            | 0.03                     | 0.04                                | 4.33                | -                           | -                                      | 5.63            | 0.01                   | 0.16                              | 28.19                                | 1.14  | 4.03                               |
| 32           | Shaheed Sikandarabad | 6.10             | 0.05                     | 0.79                                | -                   | -                           | -                                      | 0.19            | 0.00                   | 0.42                              | 0.00                                 | 0.00  | 0.00                               |
| 33           | Loralai              | 54.76            | 0.10                     | 0.18                                | 6.10                | -                           | -                                      | 1.44            | 0.01                   | 0.47                              | 7.69                                 | 0.00  | 0.02                               |
| 34           | Panjgur              | -                | -                        | -                                   | -                   | -                           | -                                      | 0.96            | -                      | -                                 | 0.00                                 | 0.00  | 0.00                               |
| 35           | Chaman               | 2.61             | 0.07                     | 2.56                                | -                   | -                           | -                                      | 0.16            | 0.00                   | 0.80                              | 0.00                                 | 0.00  | 0.00                               |
| <b>Total</b> |                      | <b>2 585</b>     | <b>72.76</b>             | <b>2.81</b>                         | <b>128.77</b>       | <b>0.02</b>                 | <b>0.02</b>                            | <b>1 214.55</b> | <b>505.64</b>          | <b>41.63</b>                      | <b>587</b>                           | <b>199</b>  | <b>33.85</b>                       |

Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).

Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

## Annex VI. Impacted crop type area in Punjab in August 2022

Table 19. Flooded rice crop area, cotton crop area, sugarcane crop area, and potential wheat cultivation area at district level (administrative level 2) in Punjab during 1–31 August 2022 using Sentinel 1

| ID | Districts       | Cotton crop area | Flooded cotton crop area | Flooded cotton crop area percentage | Sugarcane crop area | Flooded sugarcane crop area | Flooded sugarcane crop area percentage | Rice crop area  | Flooded rice crop area | Flooded rice crop area percentage | Potential area for wheat cultivation | Flooded potential area for wheat crop cultivation | Flooded wheat crop area percentage |
|----|-----------------|------------------|--------------------------|-------------------------------------|---------------------|-----------------------------|--|-----------------|------------------------|-----------------------------------|--------------------------------------|---|------------------------------------|
|    |                 | km <sup>2</sup>  | km <sup>2</sup>          | %                                   | km <sup>2</sup>     | km <sup>2</sup>             | %                                      | km <sup>2</sup> | km <sup>2</sup>        | %                                 | km <sup>2</sup>                      | km <sup>2</sup>                                   | %                                  |
| 1  | Faisalabad      | 572              | 3                        | 0                                   | 181                 | 1                           | 1                                      | 570             | 31                     | 5.4                               | 1 394                                | 64  | 4.62                               |
| 2  | Gujranwala      | 7                | 2                        | 25                                  | -                   | -                           | -                                      | 1 932           | 531                    | 27.5                              | 1 204                                | 276   | 22.95                              |
| 3  | Gujrat          | 0                | -                        | -                                   | -                   | -                           | -                                      | 750             | 84                     | 11.2                              | 182                                  | 12  | 6.74                               |
| 4  | Hafizabad       | 60               | 3                        | 5                                   | -                   | -                           | -                                      | 1 251           | 251                    | 20.0                              | 933                                  | 154   | 16.46                              |
| 5  | Jhang           | 602              | 53                       | 9                                   | 655                 | 58                          | 9                                      | 1 418           | 314                    | 22.2                              | 1 490                                | 294   | 19.71                              |
| 6  | Jhelum          | 1                | 0                        | 3                                   | -                   | -                           | -                                      | 390             | 13                     | 3.2                               | 91                                   | 3   | 3.23                               |
| 7  | Kasur           | 205              | 18                       | 9                                   | -                   | -                           | -                                      | 215             | 27                     | 12.4                              | 844                                  | 84  | 9.92                               |
| 8  | Khanewal        | 76               | 7                        | 9                                   | 1 821               | 88                          | 5                                      | 1 320           | 123                    | 9.3                               | 1 582                                | 111   | 7.02                               |
| 9  | Khushab         | 122              | 10                       | 8                                   | 0                   | -                           | -                                      | 680             | 122                    | 17.9                              | 336                                  | 77  | 23.07                              |
| 10 | Lahore          | 3                | 0                        | 6                                   | -                   | -                           | -                                      | 332             | 54                     | 16.3                              | 235                                  | 44  | 18.75                              |
| 11 | Leiah           | 187              | 3                        | 2                                   | 663                 | 12                          | 2                                      | 1 305           | 56                     | 4.3                               | 1 341                                | 51  | 3.82                               |
| 12 | Lodhran         | 4                | 1                        | 18                                  | 1 619               | 69                          | 4                                      | 1 062           | 60                     | 5.7                               | 1 276                                | 40  | 3.16                               |
| 13 | Mandi Bahauddin | 204              | 8                        | 4                                   | -                   | -                           | -                                      | 646             | 124                    | 19.2                              | 490                                  | 47  | 9.69                               |
| 14 | Mianwali        | 10               | 1                        | 10                                  | 523                 | 10                          | 2                                      | 1 437           | 200                    | 13.9                              | 745                                  | 95  | 12.82                              |
| 15 | Multan          | 7                | 0                        | 3                                   | 1 228               | 67                          | 5                                      | 805             | 89                     | 11.0                              | 1 049                                | 67  | 6.39                               |
| 16 | Muzaffargarh    | 456              | 3                        | 1                                   | 2 083               | 39                          | 2                                      | 1 035           | 102                    | 9.8                               | 1 699                                | 109   | 6.43                               |
| 17 | Nankana sahib   | 132              | 7                        | 5                                   | 1                   | 0                           | 2                                      | 755             | 172                    | 22.8                              | 908                                  | 142   | 15.58                              |
| 18 | Attock          | -                | -                        | -                                   | -                   | -                           | -                                      | 636             | 86                     | 14                                | 231                                  | 42  | 18.37                              |
| 19 | Bahawalnagar    | 55               | 0                        | 0                                   | 2 223               | 6                           | 0                                      | 155             | 2                      | 1.6                               | 2 841                                | 97  | 3.42                               |
| 20 | Bahawalpur      | 131              | 1                        | 1                                   | 2 863               | 45                          | 2                                      | 1 958           | 83                     | 4.3                               | 2 316                                | 58  | 2.52                               |

| ID | Districts       | Cotton crop area | Flooded cotton crop area | Flooded cotton crop area percentage | Sugarcane crop area | Flooded sugarcane crop area | Flooded sugarcane crop area percentage | Rice crop area  | Flooded rice crop area | Flooded rice crop area percentage | Potential area for wheat cultivation | Flooded potential area for wheat crop cultivation | Flooded wheat crop area percentage |
|----|-----------------|------------------|--------------------------|-------------------------------------|---------------------|-----------------------------|--|-----------------|------------------------|-----------------------------------|--------------------------------------|---|------------------------------------|
|    |                 | km <sup>2</sup>  | km <sup>2</sup>          | %                                   | km <sup>2</sup>     | km <sup>2</sup>             | %                                      | km <sup>2</sup> | km <sup>2</sup>        | %                                 | km <sup>2</sup>                      | km <sup>2</sup>                                   | %                                  |
| 21 | Bhakkar         | 200              | 1                        | 1                                   | 568                 | 3                           | 1                                      | 1 371           | 10                     | 0.7                               | 820                                  | 5   | 0.58                               |
| 22 | Chakwal         | -                | -                        | -                                   | -                   | -                           | -                                      | 902             | 22                     | 2                                 | 169                                  | 12  | 6.87                               |
| 23 | Chiniot         | 433              | 4                        | 1                                   | 1                   | -                           | -                                      | 571             | 30                     | 5.3                               | 517                                  | 13  | 2.51                               |
| 24 | Dera ghazi Khan | 25               | 0                        | 1                                   | 842                 | 35                          | 4                                      | 929             | 297                    | 31.9                              | 1 172                                | 204   | 17.38                              |
| 25 | Narowal         | 0                | 0                        | 31                                  | -                   | -                           | -                                      | 1 178           | 220                    | 18.7                              | 394                                  | 82  | 20.70                              |
| 26 | Okara           | 150              | 5                        | 3                                   | 144                 | 11                          | 7                                      | -               | -                      | 0.0                               | 1 312                                | 82  | 6.27                               |
| 27 | Pakpattan       | 74               | 8                        | 11                                  | 540                 | 14                          | 3                                      | -               | -                      | 0.0                               | 772                                  | 25  | 3.20                               |
| 28 | Rahim yar Khan  | 1 128            | 1                        | 0                                   | 2 248               | 9                           | 0                                      | 1 340           | 61                     | 4.5                               | 2 353                                | 71  | 3.02                               |
| 29 | Rajanpur        | 184              | 2                        | 1                                   | 1 778               | 104                         | 6                                      | 709             | 226                    | 31.9                              | 1 325                                | 251   | 18.96                              |
| 30 | Rawalpindi      | -                | -                        | -                                   | -                   | -                           | -                                      | 566             | 1                      | 0                                 | 158                                  | 1   | 0.90                               |
| 31 | Sahiwal         | 63               | 1                        | 2                                   | 1 001               | 21                          | 2                                      | 294             | 4                      | 1.2                               | 918                                  | 18  | 1.91                               |
| 32 | Sargodha        | 474              | 20                       | 4                                   | 23                  | 1                           | 2                                      | 815             | 91                     | 11.2                              | 1 024                                | 64  | 6.26                               |
| 33 | Sheikhupura     | 96               | 11                       | 12                                  | -                   | -                           | -                                      | 1 860           | 704                    | 37.9                              | 1 264                                | 392   | 31.02                              |
| 34 | Sialkot         | 5                | 0                        | 10                                  | -                   | -                           | -                                      | 1 421           | 614                    | 43.2                              | 533                                  | 187   | 35.07                              |
| 35 | Toba tek singh  | 266              | 3                        | 1                                   | 271                 | 4                           | 1                                      | 747             | 39                     | 5.2                               | 861                                  | 21  | 2.40                               |
| 36 | Vehari          | 47               | 2                        | 3                                   | 2 200               | 45                          | 2                                      | 1 349           | 34                     | 2.5                               | 1 437                                | 18  | 1.28                               |
|    | <b>Total</b>    | <b>5 979</b>     | <b>177</b>               | <b>3</b>                            | <b>23 475</b>       | <b>639</b>                  | <b>3</b>                               | <b>32 703</b>   | <b>4 877</b>           | <b>14.9</b>                       | <b>36 216</b>                        | <b>3 314</b>                                      | <b>9.15</b>                        |

Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).

Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

# Annex VII. Impacted forest area in Pakistan in August 2022

Table 20. Flooded forest area at district level (administrative level 2) in Sindh, Punjab, Khyber Pakhtunkhwa and Balochistan during 1–31 August 2022 using Sentinel 1

| Province    | Districts  | Trees sparse natural vegetation area | Flooded trees sparse natural vegetation area | Flooded trees sparse natural vegetation area percentage | Trees dense natural vegetation area | Flooded trees dense natural vegetation area | Flooded trees dense natural vegetation area percentage | Tree forest plantations area | Flooded tree forest plantations area | Flooded tree forest plantation | Total forest area | Total flooded forest area | Flooded forest area percentage |
|-------------|------------|--------------------------------------|--|---|-------------------------------------|---|--|------------------------------|--------------------------------------|--------------------------------|-------------------|---------------------------|--------------------------------|
|             |            | km <sup>2</sup>                      | km <sup>2</sup>                              | %   | km <sup>2</sup>                     | km <sup>2</sup>                             | %  | km <sup>2</sup>              | km <sup>2</sup>                      | %                              | km <sup>2</sup>   | km <sup>2</sup>           | %                              |
| Balochistan | Dera bugti | 60                                   | 1  | 1   | 22                                  | 0   | 2  | -                            | -                                    | -                              | 83                | 1                         | 1                              |
|             | Gwadar     | 6                                    | -  | -   | 0                                   | -   | -  | -                            | -                                    | -                              | 6                 | -                         | -                              |
|             | Harnai     | 332                                  | 0  | 0   | 78                                  | 0   | 0  | -                            | -                                    | -                              | 410               | 0                         | 0                              |
|             | Sohbatpur  | 5                                    | 1  | 18  | 0                                   | -   | -  | -                            | -                                    | -                              | 5                 | 1                         | 17                             |
|             | Jaffarabad | 3                                    | 2  | 69  | 0                                   | 0   | 30   | -                            | -                                    | -                              | 3                 | 2                         | 69                             |
|             | Washuk     | 6                                    | 0  | 0   | 1                                   | 0   | 1  | -                            | -                                    | -                              | 7                 | 0                         | 0                              |
|             | Zhob       | 363                                  | 0  | 0   | 36                                  | 0   | 0  | -                            | -                                    | -                              | 399               | 0                         | 0                              |
|             | Duki       | 53                                   | 0  | 0   | 14                                  | 0   | 0  | -                            | -                                    | -                              | 67                | 0                         | 0                              |
|             | Mastung    | 6                                    | 0  | 0   | 2                                   | -   | -  | -                            | -                                    | -                              | 8                 | 0                         | 0                              |
|             | Musakhel   | 753                                  | 0  | 0   | 247                                 | -   | -  | -                            | -                                    | -                              | 1 000             | 0                         | 0                              |
|             | Ziarat     | 106                                  | 0  | 0   | 54                                  | -   | -  | -                            | -                                    | -                              | 160               | 0                         | 0                              |
|             | Awaran     | 33                                   | 0  | 1   | 15                                  | 0   | 0  | -                            | -                                    | -                              | 48                | 0                         | 0                              |
|             | Barkhan    | 107                                  | 0  | 0   | 71                                  | 0   | 0  | -                            | -                                    | -                              | 177               | 0                         | 0                              |
|             | Chagai     | 17                                   | 0  | 0   | 1                                   | -   | -  | -                            | -                                    | -                              | 19                | 0                         | 0                              |
|             | Jhal Magsi | 66                                   | 4  | 6   | 1                                   | 0   | 0  | -                            | -                                    | -                              | 67                | 4                         | 5                              |
|             | Kachhi     | 43                                   | 1  | 2   | 7                                   | 0   | 1  | -                            | -                                    | -                              | 50                | 1                         | 2                              |
|             | Kalat      | 21                                   | 0  | 0   | 19                                  | 0   | 0  | -                            | -                                    | -                              | 40                | 0                         | 0                              |
| Kech        | 59         | 0                                    | 0  | 3   | -                                   | -   | -  | -                            | -                                    | 62                             | 0                 | 0                         |                                |

| Province                 | Districts            | Trees sparse natural vegetation area | Flooded trees sparse natural vegetation area | Flooded trees sparse natural vegetation area percentage | Trees dense natural vegetation area | Flooded trees dense natural vegetation area | Flooded trees dense natural vegetation area percentage | Tree forest plantations area | Flooded tree forest plantations area | Flooded tree forest plantation | Total forest area | Total flooded forest area | Flooded forest area percentage |
|--------------------------|----------------------|--------------------------------------|--|---|-------------------------------------|---|--|------------------------------|--------------------------------------|--------------------------------|-------------------|---------------------------|--------------------------------|
|                          |                      | km <sup>2</sup>                      | km <sup>2</sup>                              | %   | km <sup>2</sup>                     | km <sup>2</sup>                             | %  | km <sup>2</sup>              | km <sup>2</sup>                      | %                              | km <sup>2</sup>   | km <sup>2</sup>           | %                              |
| Balochistan              | Kharan               | 12                                   | 1  | 6   | 1                                   | 0   | 7  | -                            | -                                    | -                              | 13                | 1                         | 6                              |
|                          | Khuzdar              | 154                                  | 0  | 0   | 225                                 | 0   | 0  | -                            | -                                    | -                              | 379               | 0                         | 0                              |
|                          | Killa Abdullah       | 5                                    | 0  | 1   | 0                                   | -   | -  | -                            | -                                    | -                              | 5                 | 0                         | 1                              |
|                          | Killa Saifullah      | 41                                   | 0  | 0   | 13                                  | 0   | 0  | -                            | -                                    | -                              | 54                | 0                         | 0                              |
|                          | Kohlu                | 28                                   | 0  | 0   | 42                                  | 0   | 0  | -                            | -                                    | -                              | 70                | 0                         | 0                              |
|                          | Lasbela              | 42                                   | 0  | 1   | 24                                  | 0   | 0  | -                            | -                                    | -                              | 65                | 0                         | 1                              |
|                          | Lehri                | 28                                   | 1  | 5   | 0                                   | 0   | 7  | -                            | -                                    | -                              | 28                | 1                         | 5                              |
|                          | Nasirabad            | 27                                   | 1  | 2   | -                                   | -   | -  | -                            | -                                    | -                              | 27                | 1                         | 2                              |
|                          | Nushki               | 1                                    | 0  | 0   | 0                                   | -   | -  | -                            | -                                    | -                              | 1                 | 0                         | 0                              |
|                          | Pishin               | 19                                   | 0  | 0   | 6                                   | -   | -  | -                            | -                                    | -                              | 25                | 0                         | 0                              |
|                          | Quetta               | 50                                   | 0  | 0   | 13                                  | 0   | 0  | -                            | -                                    | -                              | 63                | 0                         | 0                              |
|                          | Sherani              | 381                                  | 1  | 0   | 46                                  | 0   | 0  | -                            | -                                    | -                              | 427               | 1                         | 0                              |
|                          | Sibi                 | 52                                   | 0  | 0   | 46                                  | 0   | 0  | -                            | -                                    | -                              | 98                | 0                         | 0                              |
|                          | Shaheed Sikandarabad | 1                                    | 0  | 0   | 0                                   | -   | -  | -                            | -                                    | -                              | 1                 | 0                         | 0                              |
|                          | Loralai              | 14                                   | 0  | 0   | 7                                   | 0   | 0  | -                            | -                                    | -                              | 21                | 0                         | 0                              |
|                          | Panjgur              | 28                                   | 0  | 0   | 5                                   | 0   | 0  | -                            | -                                    | -                              | 33                | 0                         | 0                              |
|                          | Chaman               | 7                                    | 0  | 1   | 0                                   | -   | -  | -                            | -                                    | -                              | 7                 | 0                         | 1                              |
| <b>Total Balochistan</b> |                      | <b>2 929</b>                         | <b>13</b>                                    | <b>0</b>  | <b>1 000</b>                        | <b>1</b>                                    | <b>0</b>   | <b>-</b>                     | <b>-</b>                             | <b>-</b>                       | <b>3 929</b>      | <b>14</b>                 | <b>0</b>                       |
| Khyber Pakhtunkhwa       | Mohmand              | 18                                   | 0  | 0   | 23                                  | -   | -  | -                            | -                                    | -                              | 41                | 0                         | 0                              |
|                          | North Waziristan     | 443                                  | 0  | 0   | 165                                 | 0   | 0  | -                            | -                                    | -                              | 609               | 0                         | 0                              |
|                          | Orakzai              | 83                                   | -  | -   | 390                                 | -   | -  | -                            | -                                    | -                              | 473               | -                         | -                              |



| Province | Districts        | Trees sparse natural vegetation area | Flooded trees sparse natural vegetation area | Flooded trees sparse natural vegetation area percentage | Trees dense natural vegetation area | Flooded trees dense natural vegetation area | Flooded trees dense natural vegetation area percentage | Tree forest plantations area | Flooded tree forest plantations area | Flooded tree forest plantation | Total forest area | Total flooded forest area | Flooded forest area percentage |
|----------|------------------|--------------------------------------|--|---|-------------------------------------|---|--|------------------------------|--------------------------------------|--------------------------------|-------------------|---------------------------|--------------------------------|
|          |                  | km <sup>2</sup>                      | km <sup>2</sup>                              | %   | km <sup>2</sup>                     | km <sup>2</sup>                             | %  | km <sup>2</sup>              | km <sup>2</sup>                      | %                              | km <sup>2</sup>   | km <sup>2</sup>           | %                              |
|          | South Waziristan | 825                                  | 0  | 0   | 259                                 | 0   | 0  | -                            | -                                    | -                              | 1 084             | 0                         | 0                              |
|          | Lakki Marwat     | 5                                    | 0  | 1   | 1                                   | 0   | 2  | -                            | -                                    | -                              | 6                 | 0                         | 1                              |
|          | Mardan           | 17                                   | 0  | 0   | 56                                  | 0   | 0  | -                            | -                                    | -                              | 73                | 0                         | 0                              |
|          | Nowshera         | 46                                   | 0  | 0   | 99                                  | 0   | 0  | -                            | -                                    | -                              | 144               | 0                         | 0                              |
|          | Peshawar         | 39                                   | 0  | 0   | 15                                  | -   | -  | -                            | -                                    | -                              | 54                | 0                         | 0                              |
|          | Shangla          | 111                                  | -  | -   | 918                                 | -   | -  | -                            | -                                    | -                              | 1 029             | -                         | -                              |
|          | Swabi            | 23                                   | 0  | 0   | 83                                  | 0   | 0  | -                            | -                                    | -                              | 106               | 0                         | 0                              |
|          | Swat             | 395                                  | 0  | 0   | 1 514                               | 0   | 0  | -                            | -                                    | -                              | 1 909             | 0                         | 0                              |
|          | Tank             | 79                                   | 0  | 0   | 2                                   | 0   | 1  | -                            | -                                    | -                              | 80                | 0                         | 0                              |
|          | Bajaur           | 87                                   | 0  | 0   | 116                                 | 0   | 0  | -                            | -                                    | -                              | 203               | 0                         | 0                              |
|          | Khyber           | 187                                  | 0  | 0   | 484                                 | -   | -  | -                            | -                                    | -                              | 671               | 0                         | 0                              |
|          | Kurram           | 437                                  | 0  | 0   | 419                                 | -   | -  | -                            | -                                    | -                              | 856               | 0                         | 0                              |
|          | Abbottabad       | 194                                  | -  | -   | 856                                 | -   | -  | -                            | -                                    | -                              | 1 050             | -                         | -                              |
|          | Bannu            | 3                                    | 0  | 2   | 0                                   | -   | -  | -                            | -                                    | -                              | 3                 | 0                         | 2                              |
|          | Batagram         | 151                                  | -  | -   | 742                                 | -   | -  | -                            | -                                    | -                              | 893               | -                         | -                              |
|          | Buner            | 202                                  | 0  | 0   | 545                                 | 0   | 0  | -                            | -                                    | -                              | 747               | 0                         | 0                              |
|          | Charsadda        | 3                                    | -  | -   | 5                                   | -   | -  | -                            | -                                    | -                              | 7                 | -                         | -                              |
|          | Chitral upper    | 67                                   | 0  | 0   | 79                                  | -   | -  | -                            | -                                    | -                              | 146               | 0                         | 0                              |
|          | D. I. Khan       | 78                                   | 1  | 1   | 34                                  | 3   | 8  | -                            | -                                    | -                              | 112               | 3                         | 3                              |
|          | Hangu            | 19                                   | 0  | 0   | 40                                  | -   | -  | -                            | -                                    | -                              | 59                | 0                         | 0                              |
|          | Haripur          | 257                                  | 0  | 0   | 322                                 | 0   | 0  | -                            | -                                    | -                              | 579               | 0                         | 0                              |
|          | Karak            | 8                                    | 0  | 0   | 32                                  | -   | -  | -                            | -                                    | -                              | 40                | 0                         | 0                              |

| Province                        | Districts            | Trees sparse natural vegetation area | Flooded trees sparse natural vegetation area | Flooded trees sparse natural vegetation area percentage | Trees dense natural vegetation area | Flooded trees dense natural vegetation area | Flooded trees dense natural vegetation area percentage | Tree forest plantations area | Flooded tree forest plantations area | Flooded tree forest plantation | Total forest area | Total flooded forest area | Flooded forest area percentage |
|---------------------------------|----------------------|--------------------------------------|--|---|-------------------------------------|---|--|------------------------------|--------------------------------------|--------------------------------|-------------------|---------------------------|--------------------------------|
|                                 |                      | km <sup>2</sup>                      | km <sup>2</sup>                              | %   | km <sup>2</sup>                     | km <sup>2</sup>                             | %  | km <sup>2</sup>              | km <sup>2</sup>                      | %                              | km <sup>2</sup>   | km <sup>2</sup>           | %                              |
| Khyber Pakhtunkhwa              | Kohat                | 45                                   | 0  | 0   | 102                                 | -   | -  | -                            | -                                    | -                              | 147               | 0                         | 0                              |
|                                 | Kohistan Upper       | 869                                  | 0  | 0   | 598                                 | -   | -  | -                            | -                                    | -                              | 1 467             | 0                         | 0                              |
|                                 | Lower Dir            | 163                                  | 0  | 0   | 313                                 | -   | -  | -                            | -                                    | -                              | 476               | 0                         | 0                              |
|                                 | Malakand             | 26                                   | -  | -   | 32                                  | -   | -  | -                            | -                                    | -                              | 59                | -                         | -                              |
|                                 | Mansehra             | 408                                  | 0  | 0   | 1 280                               | -   | -  | -                            | -                                    | -                              | 1 688             | 0                         | 0                              |
|                                 | Tor Ghar             | 49                                   | 0  | 0   | 279                                 | -   | -  | -                            | -                                    | -                              | 328               | 0                         | 0                              |
|                                 | Upper Dir            | 601                                  | -  | -   | 1 408                               | -   | -  | -                            | -                                    | -                              | 2 009             | -                         | -                              |
|                                 | Kohistan Lower       | 91                                   | -  | -   | 307                                 | -   | -  | -                            | -                                    | -                              | 399               | -                         | -                              |
|                                 | Kolai Palas Kohistan | 93                                   | -  | -   | 439                                 | -   | -  | -                            | -                                    | -                              | 532               | -                         | -                              |
|                                 | Chitral Lower        | 650                                  | -  | -   | 279                                 | -   | -  | -                            | -                                    | -                              | 929               | -                         | -                              |
| <b>Total Khyber Pakhtunkhwa</b> | <b>6 771</b>         | <b>2</b>                             | <b>0</b>                                     | <b>236</b>  | <b>3</b>                            | <b>0</b>                                    | <b>-</b>   | <b>-</b>                     | <b>-</b>                             | <b>19 007</b>                  | <b>5</b>          | <b>0</b>                  |                                |
| Punjab                          | Faisalabad           | 3                                    | 0  | 0   | 1                                   | -   | -  | 3                            | -                                    | -                              | 7                 | 0                         | 0                              |
|                                 | Gujranwala           | 4                                    | 0  | 0   | 1                                   | -   | -  | 0                            | -                                    | -                              | 5                 | 0                         | 0                              |
|                                 | Gujrat               | 173                                  | 1  | 0   | 2                                   | -   | -  | -                            | -                                    | -                              | 175               | 1                         | 0                              |
|                                 | Hafizabad            | 4                                    | 0  | 0   | 1                                   | 0   | 2  | 1                            | -                                    | -                              | 6                 | 0                         | 0                              |
|                                 | Jhang                | 2                                    | 1  | 24  | 1                                   | 0   | 35   | 54                           | 0                                    | 0                              | 57                | 1                         | 2                              |
|                                 | Jhelum               | 571                                  | 0  | 0   | 27                                  | -   | -  | -                            | -                                    | -                              | 599               | 0                         | 0                              |
|                                 | Kasur                | 0                                    | -  | -   | 1                                   | 0   | 4  | 62                           | 0                                    | 0                              | 63                | 0                         | 0                              |
|                                 | Khanewal             | 2                                    | -  | -   | 1                                   | -   | -  | 54                           | 3                                    | 6                              | 57                | 3                         | 5                              |
|                                 | Khushab              | 874                                  | 0  | 0   | 43                                  | 1   | 2  | 14                           | 0                                    | 0                              | 931               | 1                         | 0                              |
|                                 | Lahore               | 1                                    | 0  | 1   | 0                                   | -   | -  | -                            | -                                    | -                              | 1                 | 0                         | 0                              |

| Province | Districts       | Trees sparse natural vegetation area | Flooded trees sparse natural vegetation area | Flooded trees sparse natural vegetation area percentage | Trees dense natural vegetation area | Flooded trees dense natural vegetation area | Flooded trees dense natural vegetation area percentage | Tree forest plantations area | Flooded tree forest plantations area | Flooded tree forest plantation | Total forest area | Total flooded forest area | Flooded forest area percentage |
|----------|-----------------|--------------------------------------|--|---|-------------------------------------|---|--|------------------------------|--------------------------------------|--------------------------------|-------------------|---------------------------|--------------------------------|
|          |                 | km <sup>2</sup>                      | km <sup>2</sup>                              | %   | km <sup>2</sup>                     | km <sup>2</sup>                             | %  | km <sup>2</sup>              | km <sup>2</sup>                      | %                              | km <sup>2</sup>   | km <sup>2</sup>           | %                              |
|          | Leiah           | 1                                    | -  | -   | 0                                   | -   | -  | 108                          | -                                    | -                              | 109               | -                         | -                              |
|          | Lodhran         | -                                    | -  | -   | -                                   | -   | -  | 1                            | -                                    | -                              | 1                 | -                         | -                              |
|          | Mandi Bahauddin | 12                                   | 0  | 0   | 3                                   | 0   | 2  | 22                           | -                                    | -                              | 37                | 0                         | 0                              |
|          | Mianwali        | 473                                  | 1  | 0   | 10                                  | 0   | 0  | 73                           | 0                                    | 0                              | 556               | 1                         | 0                              |
|          | Multan          | -                                    | -  | -   | 0                                   | -   | -  | -                            | -                                    | -                              | 0                 | -                         | -                              |
|          | Muzaffargarh    | 0                                    | -  | -   | 0                                   | -   | -  | -                            | -                                    | -                              | 0                 | -                         | -                              |
|          | Nankana sahib   | 3                                    | 0  | 6   | 1                                   | 0   | 1  | 0                            | -                                    | -                              | 5                 | 0                         | 5                              |
|          | Attock          | 1 474                                | 14   | 1   | 191                                 | 0   | 0  | 0                            | -                                    | -                              | 1 665             | 14                        | 1                              |
|          | Bahawalnagar    | 0                                    | -  | -   | -                                   | -   | -  | 4                            | -                                    | -                              | 4                 | -                         | -                              |
|          | Bahawalpur      | 0                                    | -  | -   | 57                                  | 0   | 0  | 2                            | -                                    | -                              | 59                | 0                         | 0                              |
|          | Bhakkar         | 2                                    | 0  | 0   | 3                                   | -   | -  | 31                           | 0                                    | 0                              | 36                | 0                         | 0                              |
|          | Chakwal         | 1 784                                | 1  | 0   | 55                                  | 0   | 0  | -                            | -                                    | -                              | 1 840             | 1                         | 0                              |
|          | Chiniot         | 0                                    | -  | -   | 0                                   | -   | -  | -                            | -                                    | -                              | 0                 | -                         | -                              |
|          | Dera Ghazi Khan | 72                                   | 1  | 1   | 3                                   | 0   | 1  | 2                            | -                                    | -                              | 77                | 1                         | 1                              |
|          | Narowal         | 9                                    | 0  | 1   | 1                                   | 0   | 1  | -                            | -                                    | -                              | 10                | 0                         | 1                              |
|          | Okara           | 1                                    | -  | -   | 0                                   | -   | -  | 26                           | 0                                    | 0                              | 27                | 0                         | 0                              |
|          | Pakpattan       | 0                                    | -  | -   | -                                   | -   | -  | 6                            | 0                                    | 0                              | 6                 | 0                         | 0                              |
|          | Rahim Yar Khan  | 6                                    | 0  | 3   | 18                                  | 0   | 1  | 5                            | 0                                    | 0                              | 29                | 0                         | 1                              |
|          | Rajanpur        | 15                                   | 1  | 4   | 4                                   | 0   | 2  | -                            | -                                    | -                              | 19                | 1                         | 4                              |
|          | Rawalpindi      | 1 475                                | 0  | 0   | 630                                 | 0   | 0  | 0                            | -                                    | -                              | 2 105             | 0                         | 0                              |
|          | Sahiwal         | 0                                    | -  | -   | 0                                   | -   | -  | 48                           | 0                                    | 0                              | 48                | 0                         | 0                              |

| Province | Districts             | Trees sparse natural vegetation area | Flooded trees sparse natural vegetation area | Flooded trees sparse natural vegetation area percentage | Trees dense natural vegetation area | Flooded trees dense natural vegetation area | Flooded trees dense natural vegetation area percentage | Tree forest plantations area | Flooded tree forest plantations area | Flooded tree forest plantation | Total forest area | Total flooded forest area | Flooded forest area percentage |
|----------|-----------------------|--------------------------------------|--|---|-------------------------------------|---|--|------------------------------|--------------------------------------|--------------------------------|-------------------|---------------------------|--------------------------------|
|          |                       | km <sup>2</sup>                      | km <sup>2</sup>                              | %   | km <sup>2</sup>                     | km <sup>2</sup>                             | %  | km <sup>2</sup>              | km <sup>2</sup>                      | %                              | km <sup>2</sup>   | km <sup>2</sup>           | %                              |
|          | Sargodha              | 3                                    | 0  | 0   | 5                                   | 0   | 0  | 4                            | -                                    | -                              | 12                | 0                         | 0                              |
|          | Sheikhupura           | 2                                    | 0  | 4   | 2                                   | 0   | 2  | 0                            | -                                    | -                              | 4                 | 0                         | 3                              |
|          | Sialkot               | 7                                    | 0  | 1   | 1                                   | 0   | 6  | -                            | -                                    | -                              | 7                 | 0                         | 1                              |
|          | Toba Tek Singh        | 1                                    | -  | -   | 0                                   | 0   | 3  | 50                           | 0                                    | 0                              | 52                | 0                         | 0                              |
|          | Vehari                | 0                                    | -  | -   | 1                                   | -   | -  | -                            | -                                    | -                              | 1                 | -                         | -                              |
|          | <b>Total Punjab</b>   | <b>6 976</b>                         | <b>20</b>                                    | <b>0</b>  | <b>1 062</b>                        | <b>2</b>                                    | <b>0</b>   | <b>573</b>                   | <b>4</b>                             | <b>1</b>                       | <b>8 610</b>      | <b>26</b>                 | <b>0</b>                       |
| Sindh    | Dadu                  | 55.60                                | 19.90  | 35.80   | 22.20                               | 1.55  | 6.97   | -                            | -                                    | -                              | 77.80             | 21.45                     | 27.57                          |
|          | South Karachi         | 6.65                                 | 0.00   | 0.02  | 12.25                               | 0.00  | 0.01   | -                            | -                                    | -                              | 18.89             | 0.00                      | 0.01                           |
|          | Sujawal               | 139.43                               | 23.13  | 16.59   | 591.64                              | 40.64                                       | 6.87   | -                            | -                                    | -                              | 731.07            | 63.78                     | 8.72                           |
|          | Sukkur                | 84.51                                | 13.43  | 15.89   | 24.79                               | 5.44  | 21.92  | -                            | -                                    | -                              | 109.30            | 18.86                     | 17.26                          |
|          | West Karachi          | 6.06                                 | 0.02   | 0.31  | 1.35                                | 0.00  | 0.01   | -                            | -                                    | -                              | 7.41              | 0.02                      | 0.25                           |
|          | East Karachi          | 0.75                                 | 0.00   | 0.17  | 0.67                                | 0.09  | 13.18  | -                            | -                                    | -                              | 1.42              | 0.09                      | 6.28                           |
|          | Ghotki                | 180.25                               | 29.24  | 16.22   | 28.86                               | 2.07  | 7.17   | -                            | -                                    | -                              | 209.11            | 31.31                     | 14.97                          |
|          | Korangi Karachi       | 0.67                                 | 0.06   | 9.03  | 2.12                                | 0.27  | 12.50  | -                            | -                                    | -                              | 2.79              | 0.33                      | 11.67                          |
|          | Larkana               | 46.45                                | 24.97  | 53.75   | 7.07                                | 1.42  | 20.16  | -                            | -                                    | -                              | 53.52             | 26.40                     | 49.32                          |
|          | Malir Karachi         | 51.38                                | 0.06   | 0.11  | 96.78                               | 0.06  | 0.06   | -                            | -                                    | -                              | 148.16            | 0.11                      | 0.08                           |
|          | Badin                 | 214.44                               | 38.96  | 18.17   | 47.62                               | 12.08                                       | 25.36  | -                            | -                                    | -                              | 262.06            | 51.04                     | 19.48                          |
|          | Hyderabad             | 30.76                                | 3.80   | 12.35   | 6.22                                | 0.57  | 9.14   | -                            | -                                    | -                              | 36.98             | 4.37                      | 11.81                          |
|          | Jacobabad             | 54.75                                | 38.27  | 69.91   | 2.63                                | 1.20  | 45.82  | -                            | -                                    | -                              | 57.37             | 39.48                     | 68.81                          |
|          | Jamshoro              | 45.45                                | 2.48   | 5.45  | 6.05                                | 0.32  | 5.24   | -                            | -                                    | -                              | 51.50             | 2.79                      | 5.42                           |
|          | Kambar<br>Shahdad Kot | 44.45                                | 34.41  | 77.42   | 6.32                                | 1.99  | 31.53  | -                            | -                                    | -                              | 50.77             | 36.41                     | 71.71                          |

| Province | Districts            | Trees sparse natural vegetation area | Flooded trees sparse natural vegetation area | Flooded trees sparse natural vegetation area percentage | Trees dense natural vegetation area | Flooded trees dense natural vegetation area | Flooded trees dense natural vegetation area percentage | Tree forest plantations area | Flooded tree forest plantations area | Flooded tree forest plantation | Total forest area | Total flooded forest area | Flooded forest area percentage |
|----------|----------------------|--------------------------------------|--|---|-------------------------------------|---|--|------------------------------|--------------------------------------|--------------------------------|-------------------|---------------------------|--------------------------------|
|          |                      | km <sup>2</sup>                      | km <sup>2</sup>                              | %   | km <sup>2</sup>                     | km <sup>2</sup>                             | %  | km <sup>2</sup>              | km <sup>2</sup>                      | %                              | km <sup>2</sup>   | km <sup>2</sup>           | %                              |
|          | Kashmore             | 53.03                                | 30.22  | 56.99   | 19.41                               | 6.93  | 35.71  | -                            | -                                    | -                              | 72.44             | 37.15                     | 51.28                          |
|          | Khairpur             | 219.14                               | 27.53  | 12.56   | 33.17                               | 2.55  | 7.68   | -                            | -                                    | -                              | 252.32            | 30.08                     | 11.92                          |
|          | Matiari              | 38.44                                | 5.88   | 15.31   | 13.94                               | 2.41  | 17.30  | -                            | -                                    | -                              | 52.38             | 8.30                      | 15.84                          |
|          | Mirpur Khas          | 156.24                               | 7.29   | 4.67  | 10.15                               | 0.53  | 5.27   | -                            | -                                    | -                              | 166.39            | 7.83                      | 4.70                           |
|          | Naushahro Feroze     | 134.10                               | 21.10  | 15.73   | 19.17                               | 4.36  | 22.77  | -                            | -                                    | -                              | 153.26            | 25.46                     | 16.61                          |
|          | Sanghar              | 185.87                               | 17.49  | 9.41  | 24.87                               | 1.64  | 6.61   | -                            | -                                    | -                              | 210.74            | 19.13                     | 9.08                           |
|          | Shaheed Benazir Abad | 123.80                               | 14.95  | 12.08   | 19.23                               | 0.93  | 4.84   | -                            | -                                    | -                              | 143.03            | 15.88                     | 11.10                          |
|          | Shikarpur            | 76.26                                | 39.47  | 51.76   | 10.90                               | 2.86  | 26.24  | -                            | -                                    | -                              | 87.16             | 42.33                     | 48.57                          |
|          | Tando Allahyar       | 62.23                                | 10.48  | 16.84   | 11.49                               | 1.59  | 13.80  | -                            | -                                    | -                              | 73.72             | 12.06                     | 16.36                          |
|          | Tando Muhammad Khan  | 55.57                                | 16.20  | 29.15   | 4.42                                | 0.69  | 15.56  | -                            | -                                    | -                              | 59.98             | 16.88                     | 28.15                          |
|          | Tharparkar           | 67.64                                | 0.16   | 0.23  | 7.85                                | 0.10  | 1.28   | -                            | -                                    | -                              | 75.50             | 0.26                      | 0.34                           |
|          | Thatta               | 182.51                               | 9.42   | 5.16  | 593.97                              | 9.11  | 1.53   | -                            | -                                    | -                              | 776.47            | 18.53                     | 2.39                           |
|          | Umerkot              | 71.51                                | 4.50   | 6.29  | 5.38                                | 0.59  | 10.91  | -                            | -                                    | -                              | 76.89             | 5.09                      | 6.62                           |
|          | Central Karachi      | -                                    | -  | -   | -                                   | -   | -  | -                            | -                                    | -                              | -                 | -                         | -                              |
|          | <b>Total Sindh</b>   | <b>2 388</b>                         | <b>433</b>                                   | <b>18</b>   | <b>1 631</b>                        | <b>102</b>                                  | <b>6</b>   | <b>-</b>                     | <b>-</b>                             | <b>-</b>                       | <b>4 019</b>      | <b>535</b>                | <b>13</b>                      |

Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail). Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>



## Annex VIII. People exposure to floods in Pakistan in August 2022

Table 21. People exposed to floods at district level in Sindh, Punjab, Khyber Pakhtunkhwa and Balochistan during 1–31 August 2022 using Sentinel 1

| Province    | Districts       | Population (WorldPop) | People exposed to floods |
|-------------|-----------------|-----------------------|--------------------------|
| Balochistan | Awaran          | 153 961               | 337                      |
|             | BarKhan         | 127 965               | 1 475                    |
|             | Chagai          | 135 296               | 207                      |
|             | Chaman          | 165 068               | 7 439                    |
|             | Dera Bugti      | 234 598               | 14 882                   |
|             | Duki            | 148 493               | 1 213                    |
|             | Gwadar          | 223 736               | 323                      |
|             | Harnai          | 98 145                | 359                      |
|             | Jaffarabad      | 387 332               | 331 443                  |
|             | Jhal Magsi      | 140 029               | 30 466                   |
|             | Kachhi          | 255 394               | 34 826                   |
|             | Kalat           | 188 471               | 3 112                    |
|             | Kech            | 530 285               | 658                      |
|             | Kharan          | 110 145               | 1 724                    |
|             | Khuzdar         | 535 648               | 1 947                    |
|             | Killa Abdullah  | 238 770               | 7 486                    |
|             | Killa Saifullah | 247 858               | 1 249                    |
|             | Kohlu           | 127 850               | 2 399                    |
|             | Lasbela         | 395 455               | 3 780                    |
|             | Lehri           | 113 447               | 14 141                   |
|             | Loralai         | 171 678               | 7 973                    |
|             | Mastung         | 197 597               | 4 503                    |
|             | Musakhel        | 175 701               | 38                       |
|             | Nasirabad       | 314 870               | 150 915                  |
|             | Nushki          | 126 757               | 3 996                    |
|             | Panjgur         | 300 435               | 128                      |
|             | Pishin          | 540 546               | 24 952                   |

| Province           | Districts                | Population (WorldPop) | People exposed to floods |
|--------------------|--------------------------|-----------------------|--------------------------|
|                    | Quetta                   | 989 649               | 18 833                   |
|                    | Shaheed Sikandarabad     | 117 665               | 318                      |
|                    | Sherani                  | 116 606               | 343                      |
|                    | Sibi                     | 132 836               | 2 928                    |
|                    | Sohbatpur                | 150 210               | 80 635                   |
|                    | Washuk                   | 154 143               | 45                       |
|                    | Zhob                     | 261 042               | 504                      |
|                    | Ziarat                   | 103 416               | 697                      |
|                    | <b>Total Balochistan</b> | <b>8 411 097</b>      | <b>756 275</b>           |
| Khyber pakhtunkhwa | Abbottabad               | 1 521 584             | -                        |
|                    | Bajaur                   | 871 905               | 100                      |
|                    | Bannu                    | 1 303 327             | 72 151                   |
|                    | Batagram                 | 585 210               | 7                        |
|                    | Buner                    | 936 352               | 345                      |
|                    | Charsadda                | 1 903 134             | 1 755                    |
|                    | Chitral lower            | 339 361               | 115                      |
|                    | Chitral upper            | 245 398               | 4 327                    |
|                    | D. I. Khan               | 1 628 668             | 264 772                  |
|                    | Hangu                    | 575 968               | 181                      |
|                    | Haripur                  | 1 338 871             | 8 130                    |
|                    | Karak                    | 790 386               | 35 191                   |
|                    | Khyber                   | 872 631               | 207                      |
|                    | Kohat                    | 1 190 280             | 61 431                   |
|                    | Kohistan Lower           | 223 071               | 4                        |
|                    | Kohistan Upper           | 326 713               | 200                      |
|                    | Kolai Palas Kohistan     | 317 035               | 218                      |
|                    | Kurram                   | 716 942               | 534                      |
|                    | Lakki Marwat             | 886 060               | 193 512                  |
|                    | Lower Dir                | 1 403 856             | 160                      |
| Malakand           | 762 251                  | 12                    |                          |
| Mansehra           | 1 777 307                | 702                   |                          |
| Mardan             | 2 668 410                | 5 809                 |                          |

| Province        | Districts                       | Population (WorldPop) | People exposed to floods |
|-----------------|---------------------------------|-----------------------|--------------------------|
|                 | Mohmand                         | 572 314               | 6 933                    |
|                 | North Waziristan                | 562 700               | 4 376                    |
|                 | Nowshera                        | 1 612 543             | 9 032                    |
|                 | Orakzai                         | 338 742               | 55                       |
|                 | Peshawar                        | 3 724 680             | 8 867                    |
|                 | Shangla                         | 800 402               | 10                       |
|                 | South Waziristan                | 641 204               | 873                      |
|                 | Swabi                           | 1 880 078             | 75 582                   |
|                 | Swat                            | 2 315 923             | 3 488                    |
|                 | Tank                            | 472 974               | 85 557                   |
|                 | Tor Ghar                        | 309 202               | 152                      |
|                 | Upper Dir                       | 1 046 486             | 99                       |
|                 | <b>Total Khyber pakhtunkhwa</b> | <b>37 461 968</b>     | <b>844 889</b>           |
|                 | Punjab                          | Attock                | 2 250 044                |
| Bahawalnagar    |                                 | 3 572 120             | 91 784                   |
| Bahawalpur      |                                 | 4 220 105             | 144 735                  |
| Bhakkar         |                                 | 1 791 233             | 28 024                   |
| Chakwal         |                                 | 1 854 849             | 27 046                   |
| Chiniot         |                                 | 1 674 998             | 30 379                   |
| Dera Ghazi Khan |                                 | 2 861 171             | 246 297                  |
| Faisalabad      |                                 | 9 421 832             | 187 741                  |
| Gujranwala      |                                 | 5 901 433             | 1 044 013                |
| Gujrat          |                                 | 3 586 030             | 140 255                  |
| Hafizabad       |                                 | 1 445 333             | 200 837                  |
| Jhang           |                                 | 3 243 846             | 353 813                  |
| Jhelum          |                                 | 1 604 041             | 15 013                   |
| Kasur           |                                 | 4 108 342             | 321 919                  |
| Khanewal        |                                 | 3 589 086             | 210 627                  |
| Khushab         |                                 | 1 571 671             | 126 790                  |
| Lahore          |                                 | 10 965 050            | 946 756                  |
| Leiah           |                                 | 1 974 646             | 44 494                   |
| Lodhran         |                                 | 2 032 661             | 79 263                   |

| Province | Districts          | Population (WorldPop) | People exposed to floods |
|----------|--------------------|-----------------------|--------------------------|
|          | Mandi Bahauddin    | 2 005 565             | 145 701                  |
|          | Mianwali           | 1 828 205             | 157 857                  |
|          | Multan             | 5 409 172             | 336 013                  |
|          | Muzaffargarh       | 4 573 492             | 234 754                  |
|          | Nankana sahib      | 1 781 222             | 218 074                  |
|          | Narowal            | 2 192 876             | 307 237                  |
|          | Okara              | 3 873 627             | 343 690                  |
|          | Pakpattan          | 2 233 051             | 103 403                  |
|          | Rahim yar Khan     | 5 452 296             | 84 293                   |
|          | Rajanpur           | 1 973 128             | 261 337                  |
|          | Rawalpindi         | 5 837 183             | 5 704                    |
|          | Sahiwal            | 3 198 263             | 88 596                   |
|          | Sargodha           | 4 645 236             | 213 140                  |
|          | Sheikhupura        | 3 978 886             | 983 665                  |
|          | Sialkot            | 4 727 834             | 1 262 649                |
|          | TobaTek Singh      | 2 813 941             | 64 582                   |
|          | Vehari             | 3 627 925             | 66 953                   |
|          |                    | <b>Total Punjab</b>   | <b>127 820 393</b>       |
| Sindh    | Badin              | 1 843 129             | 800 301                  |
|          | Central Karachi    | 3 468 920             | -                        |
|          | Dadu               | 1 846 784             | 524 788                  |
|          | East Karachi       | 2 843 556             | 3 898                    |
|          | Ghotki             | 1 651 543             | 192 739                  |
|          | Hyderabad          | 2 491 263             | 330 983                  |
|          | Jacobabad          | 1 231 447             | 1 035 510                |
|          | Jamshoro           | 970 020               | 51 538                   |
|          | Kambar shahdad kot | 1 538 522             | 918 065                  |
|          | Kashmore           | 1 048 006             | 705 058                  |
|          | Khairpur           | 2 633 701             | 135 435                  |
|          | Korangi Karachi    | 2 210 760             | 66 954                   |
|          | Larkana            | 1 676 710             | 1 089 590                |
|          | Malir Karachi      | 1 317 266             | 2 872                    |

| Province           | Districts            | Population (WorldPop) | People exposed to floods |
|--------------------|----------------------|-----------------------|--------------------------|
|                    | Matiori              | 824 846               | 181 195                  |
|                    | Mirpur khas          | 1 619 481             | 203 194                  |
|                    | Naushahro feroze     | 1 812 274             | 415 525                  |
|                    | Sanghar              | 2 269 596             | 208 331                  |
|                    | Shaheed Benazir abad | 1 827 889             | 336 036                  |
|                    | Shikarpur            | 1 464 689             | 1 003 596                |
|                    | South Karachi        | 4 259 644             | 13 440                   |
|                    | Sujawal              | 880 909               | 187 373                  |
|                    | Sukkur               | 1 476 717             | 198 049                  |
|                    | Tando allahyar       | 822 645               | 155 951                  |
|                    | Tando muhammad Khan  | 728 789               | 351 814                  |
|                    | Tharparkar           | 1 502 768             | 3 284                    |
|                    | Thatta               | 933 431               | 42 770                   |
|                    | Umerkot              | 1 102 728             | 78 452                   |
|                    | West Karachi         | 2 222 959             | 1 787                    |
|                    | <b>Total Sindh</b>   | <b>50 520 992</b>     | <b>9 238 528</b>         |
| <b>Grand total</b> |                      | <b>226 256 236</b>    | <b>20 112 243</b>        |

Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).

Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>



## Annex IX. Flood extent at district level using Sentinel 1 in September 2022

Table 22. Flood extent at district level (administrative level 2) in the provinces of Sindh, Punjab, Balochistan and Khyber Pakhtunkhwa using Sentinel 1 and Sentinel 2 for the period of 1-19 September 2022

| Province | District                    | District area (km <sup>2</sup> ) | Flooded area using Sentinel 1 (km <sup>2</sup> ) | Flooded area percentage using Sentinel 1 (%) |
|----------|-----------------------------|----------------------------------|--|--|
| Sindh    | Badin                       | 6 569.86                         | 33.74  | 0.01   |
|          | Central KarachiKarachi      | -                                | -  | 0  |
|          | Dadu                        | 8 015.60                         | 911.38   | 0.11   |
|          | East KarachiKarachi         | 202.94                           | 3.29   | 0.02   |
|          | Ghotki                      | 6 362.52                         | 8.21   | 0.00   |
|          | Hyderabad                   | 1 018.17                         | 47.85  | 0.05   |
|          | Jacobabad                   | 2 689.27                         | 167.26   | 0.06   |
|          | Jamshoro                    | 11 226.14                        | 570.75   | 0.05   |
|          | Kambar Shahdad kot          | 5 595.03                         | 467.40   | 0.08   |
|          | Kashmore                    | 2 612.86                         | 169.64   | 0.06   |
|          | Khairpur                    | 15 993.72                        | 586.34   | 0.04   |
|          | Korangi KarachiKarachi      | 121.78                           | 2.74   | 0.02   |
|          | Larkana                     | 1 919.81                         | 195.28   | 0.10   |
|          | Malir KKarachi              | 2 709.22                         | 4.84   | 0.00   |
|          | Matiali                     | 1 456.89                         | 166.97   | 0.11   |
|          | Mirpur Khas                 | 3 460.43                         | 10.52  | 0.00   |
|          | Naushahro Feroze            | 3 035.02                         | 617.44   | 0.20   |
|          | Sanghar                     | 10 150.93                        | 45.31  | 0.00   |
|          | Shaheed BenazirBenazir abad | 4 579.14                         | 618.65   | 0.14   |
|          | Shikarpur                   | 2 549.90                         | 161.41   | 0.06   |
|          | South KarachiKarachi        | 507.80                           | 0.40   | 0.00   |
|          | Sujawal                     | 8 682.22                         | 417.23   | 0.05   |
|          | Sukkur                      | 5 174.67                         | 185.72   | 0.04   |
|          | Tando Allahyar              | 1 543.00                         | 2.27   | 0.00   |
|          | Tando Muhammad KKhan        | 1 675.66                         | 49.65  | 0.03   |
|          | Tharparkar                  | 19 675.24                        | 3.02   | 0.00   |
|          | Thatta                      | 7 627.44                         | 304.37   | 0.04   |
|          | Umerkot                     | 5 486.14                         | 2.09   | 0.00   |

|        |                 |                   |                 |             |
|--------|-----------------|-------------------|-----------------|-------------|
|        | West Karachi    | 241.81            | -               | -           |
|        | <b>Total</b>    | <b>140 883.19</b> | <b>5 753.77</b> | <b>4.08</b> |
| Punjab | Attock          | 6 920.71          | 89.85           | 1.30        |
|        | Bahawalnagar    | 8 602.17          | 0.23            | 0.00        |
|        | Bahawalpur      | 23 989.75         | 528.01          | 2.20        |
|        | Bhakkar         | 8 477.60          | 43.80           | 0.52        |
|        | Chakwal         | 6 499.99          | 30.49           | 0.47        |
|        | Chiniot         | 2 608.40          | -               | -           |
|        | Dera Ghazi Khan | 11 761.99         | 9.12            | 0.08        |
|        | Faisalabad      | 5 965.66          | -               | -           |
|        | Gujranwala      | 3 637.59          | -               | -           |
|        | Gujrat          | 3 182.97          | -               | -           |
|        | Hafizabad       | 2 285.71          | -               | -           |
|        | Jhang           | 6 354.46          | -               | -           |
|        | Jhelum          | 3 580.27          | -               | -           |
|        | Kasur           | 4 007.41          | -               | -           |
|        | Khanewal        | 4 361.36          | 1.58            | 0.04        |
|        | Khushab         | 6 608.34          | 8.77            | 0.13        |
|        | Lahore          | 1 739.61          | 1.04            | 0.06        |
|        | Layyah          | 6 415.01          | 9.18            | 0.14        |
|        | Lodhran         | 2 668.68          | -               | -           |
|        | Mandi Bahauddin | 2 751.36          | -               | -           |
|        | Mianwali        | 5 963.86          | 243.61          | 4.08        |
|        | Multan          | 3 650.19          | 6.54            | 0.18        |
|        | Muzaffargarh    | 7 689.33          | 10.52           | 0.14        |
|        | Nankana sahib   | 2 203.63          | -               | -           |
|        | Narowal         | 2 393.21          | -               | -           |
|        | Okara           | 4 455.81          | -               | -           |
|        | Pakpattan       | 2 893.87          | -               | -           |
|        | Rahim yar Khan  | 12 845.92         | 211.94          | 1.65        |
|        | Rajanpur        | 12 577.98         | 138.96          | 1.10        |
|        | Rawalpindi      | 5 241.50          | 2.13            | 0.04        |
|        | Sahiwal         | 3 237.32          | 0.70            | 0.02        |
|        | Sargodha        | 5 859.28          | -               | -           |

|             |                      |                   |                 |             |
|-------------|----------------------|-------------------|-----------------|-------------|
|             | Sheikhupura          | 3 646.17          | 2.36            | 0.06        |
|             | Sialkot              | 3 086.31          | 1.55            | 0.05        |
|             | Toba Tek Singh       | 3 087.83          | -               | -           |
|             | Vehari               | 4 508.04          | 0.56            | 0.01        |
|             | <b>Total</b>         | <b>205 759.31</b> | <b>1 340.94</b> | <b>0.65</b> |
| Balochistan | Awaran               | 25 052.05         | 0.63            | 0.00        |
|             | BarKhan              | 3 512.97          | 2.89            | 0.08        |
|             | Chagai               | 44 796.01         | 0.18            | 0.00        |
|             | Chaman               | 1 636.41          | 76.93           | 4.70        |
|             | Dera bugti           | 10 286.19         | -               | -           |
|             | Duki                 | 4 333.14          | 1.31            | 0.03        |
|             | Gwadar               | 11 669.11         | 336.50          | 2.88        |
|             | Harnai               | 3 061.48          | 39.55           | 1.29        |
|             | Jaffarabad           | 1 700.90          | 37.26           | 2.19        |
|             | Jhal magsi           | 3 859.00          | -               | -           |
|             | Kachhi               | 5 362.37          | -               | -           |
|             | Kalat                | 10 184.22         | -               | -           |
|             | Kech                 | 24 617.34         | -               | -           |
|             | Kharan               | 8 231.87          | 0.71            | 0.01        |
|             | Khuzdar              | 30 972.69         | 0.78            | 0.00        |
|             | Killa Abdullah       | 2 994.06          | -               | -           |
|             | Killa Saifullah      | 12 395.82         | 54.70           | 0.44        |
|             | Kohlu                | 7 722.11          | 32.46           | 0.42        |
|             | Lasbela              | 14 066.27         | 1.28            | 0.01        |
|             | Lehri                | 3 283.44          | 23.29           | 0.71        |
|             | Loralai              | 3 793.79          | -               | -           |
|             | Mastung              | 4 714.57          | 2.80            | 0.06        |
|             | Musakhel             | 5 897.15          | 1.90            | 0.03        |
|             | Nasirabad            | 3 222.96          | 289.68          | 8.99        |
|             | Nushki               | 5 872.81          | -               | -           |
|             | Panjgur              | 17 671.15         | -               | -           |
|             | Pishin               | 6 085.89          | 7.30            | 0.12        |
|             | Quetta               | 3 760.69          | 0.96            | 0.03        |
|             | Shaheed Sikandarabad | 3 710.49          | 0.51            | 0.01        |

|                    |                          |                   |                 |             |
|--------------------|--------------------------|-------------------|-----------------|-------------|
|                    | Sherani                  | 3 048.52          | 31.17           | 1.02        |
|                    | Sibi                     | 4 963.31          | -               | -           |
|                    | Sohbatpur                | 786.28            | 85.38           | 10.86       |
|                    | Washuk                   | 39 204.81         | 0.18            | 0.00        |
|                    | Zhob                     | 11 927.70         | 9.44            | 0.08        |
|                    | Ziarat                   | 3 269.75          | -               | -           |
|                    | <b>Total Balochistan</b> | <b>347 667.30</b> | <b>1 037.79</b> | <b>0.30</b> |
| Khyber Pakhtunkhwa | Abbottabad               | 1 644.50          | -               | -           |
|                    | Bajaur                   | 1 366.99          | 0.25            | 0.02        |
|                    | Bannu                    | 2 027.29          | 5.59            | 0.28        |
|                    | Batagram                 | 1 489.25          | 0.25            | 0.02        |
|                    | Buner                    | 1 777.22          | 1.67            | 0.09        |
|                    | Charsadda                | 999.88            | -               | -           |
|                    | Chitral lower            | 6 081.71          | 0.90            | 0.01        |
|                    | Chitral upper            | 8 630.52          | 3.02            | 0.03        |
|                    | D. I. Khan               | 9 026.62          | 16.20           | 0.18        |
|                    | Hangu                    | 1 371.92          | -               | -           |
|                    | Haripur                  | 1 958.60          | 1.09            | 0.06        |
|                    | Karak                    | 2 648.81          | 10.51           | 0.40        |
|                    | Khyber                   | 2 747.74          | 0.25            | 0.01        |
|                    | Kohat                    | 3 440.53          | -               | -           |
|                    | Kohistan Lower           | 825.41            | 0.37            | 0.05        |
|                    | Kohistan Upper           | 5 500.82          | 1.57            | 0.03        |
|                    | Kolai Palas Kohistan     | 1 233.29          | 0.37            | 0.03        |
|                    | Kurram                   | 3 396.96          | -               | -           |
|                    | Lakki Marwat             | 3 339.57          | 78.45           | 2.35        |
|                    | Lower Dir                | 1 606.15          | 0.33            | 0.02        |
|                    | Malakand                 | 906.55            | 0.17            | 0.02        |
|                    | Mansehra                 | 4 045.26          | -               | -           |
|                    | Mardan                   | 1 638.38          | 9.53            | 0.58        |
|                    | Mohmand                  | 2 262.73          | 0.67            | 0.03        |
|                    | North Waziristan         | 4 926.87          | 1.61            | 0.03        |
|                    | Nowshera                 | 1 727.58          | 27.97           | 1.62        |
|                    | Orakzai                  | 1 369.95          | -               | -           |

|                  |                   |               |             |
|------------------|-------------------|---------------|-------------|
| Peshawar         | 1 540.03          | -             | -           |
| Shangla          | 1 387.08          | 1.47          | 0.11        |
| South Waziristan | 6 220.29          | 10.85         | 0.17        |
| Swabi            | 1 483.00          | 9.58          | 0.65        |
| Swat             | 5 357.17          | 3.48          | 0.06        |
| Tank             | 2 817.65          | 4.18          | 0.15        |
| Tor Ghar         | 455.40            | 0.36          | 0.08        |
| Upper Dir        | 3 735.86          | 1.57          | 0.04        |
| <b>Total KP</b>  | <b>100 987.61</b> | <b>192.25</b> | <b>0.19</b> |

Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).  
Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

## Annex X. Impacted agricultural area in September 2022

Table 23. Flooded agricultural area at district level in Punjab, Sindh, Khyber Pakhtunkhwa and Balochistan during 1-19 September 2022 using Sentinel 1

| Province | Districts          | Tree orchards   | Flooded tree orchards | Herbaceous crops irrigated | Flooded irrigated herbaceous crops | Herbaceous crops rainfed | Flooded herbaceous crops rainfed | Herbaceous crops in flood plain | Flooded herbaceous crops in flood plain | Total agriculture area | Total flooded agriculture area |
|----------|--------------------|-----------------|-----------------------|----------------------------|------------------------------------|--------------------------|----------------------------------|---------------------------------|---|------------------------|--------------------------------|
|          |                    | km <sup>2</sup> | km <sup>2</sup>       | km <sup>2</sup>            | km <sup>2</sup>                    | km <sup>2</sup>          | km <sup>2</sup>                  | km <sup>2</sup>                 | km <sup>2</sup>                         | km <sup>2</sup>        | km <sup>2</sup>                |
| Sindh    | Badin              | 44              | -                     | 4 381                      | 22                                 | 18                       | 0                                | -                               | -                                       | 4 443                  | 23                             |
|          | Central Karachi    | -               | -                     | -                          | -                                  | -                        | -                                | -                               | -                                       | -                      | -                              |
|          | Dadu               | 16              | 5                     | 2 073                      | 888                                | 1 382                    | 36                               | 3                               | 1                                       | 3 475                  | 931                            |
|          | East Karachi       | 0               | -                     | 8                          | -                                  | -                        | -                                | -                               | -                                       | 8                      | -                              |
|          | Ghotki             | 52              | 0                     | 2 592                      | 56                                 | -                        | -                                | -                               | -                                       | 2 644                  | 56                             |
|          | Hyderabad          | 130             | 0                     | 402                        | 37                                 | 3                        | 0                                | 4                               | 1                                       | 539                    | 38                             |
|          | Jacobabad          | 1               | 0                     | 2 056                      | 108                                | 3                        | 0                                | -                               | -                                       | 2 061                  | 108                            |
|          | Jamshoro           | 5               | 1                     | 689                        | 252                                | 824                      | 11                               | 7                               | 4                                       | 1 524                  | 267                            |
|          | Kambar Shahdad Kot | 1               | 0                     | 2 557                      | 239                                | 202                      | 13                               | -                               | -                                       | 2 761                  | 252                            |
|          | Kashmore           | 3               | 0                     | 1 684                      | 10                                 | -                        | -                                | 24                              | 1                                       | 1 711                  | 11                             |
|          | Khairpur           | 515             | 24                    | 2 276                      | 360                                | 6                        | -                                | 7                               | 1                                       | 2 804                  | 385                            |
|          | Korangi Karachi    | -               | -                     | -                          | -                                  | -                        | -                                | -                               | -                                       | -                      | -                              |
|          | Larkana            | 37              | 1                     | 1 288                      | 63                                 | -                        | -                                | 3                               | 2                                       | 1 329                  | 66                             |
|          | Malir Karachi      | 5               | -                     | 103                        | 0                                  | 73                       | -                                | -                               | -                                       | 180                    | 0                              |
|          | Matiari            | 205             | 0                     | 904                        | 162                                | 3                        | 2                                | 2                               | 1                                       | 1 115                  | 165                            |
|          | Mirpur Khas        | 98              | 0                     | 1 716                      | 7                                  | 8                        | 0                                | -                               | -                                       | 1 822                  | 7                              |
|          | Naushahro feroze   | 216             | 11                    | 2 022                      | 381                                | 1                        | 0                                | 5                               | 2                                       | 2 245                  | 395                            |
| Sanghar  | 132                | 0               | 3 853                 | 27                         | 43                                 | 0                        | -                                | -                               | 4 029                                   | 27                     |                                |



| Province           | Districts                         | Tree orchards   | Flooded tree orchards | Herbaceous crops irrigated | Flooded irrigated herbaceous crops | Herbaceous crops rainfed | Flooded herbaceous crops rainfed | Herbaceous crops in flood plain | Flooded herbaceous crops in flood plain | Total agriculture area | Total flooded agriculture area |
|--------------------|-----------------------------------|-----------------|-----------------------|----------------------------|------------------------------------|--------------------------|----------------------------------|---------------------------------|---|------------------------|--------------------------------|
|                    |                                   | km <sup>2</sup> | km <sup>2</sup>       | km <sup>2</sup>            | km <sup>2</sup>                    | km <sup>2</sup>          | km <sup>2</sup>                  | km <sup>2</sup>                 | km <sup>2</sup>                         | km <sup>2</sup>        | km <sup>2</sup>                |
| Sindh              | Shaheed benazir Benazir Abad      | 139             | 2                     | 2 331                      | 474                                | 6                        | 3                                | 10                              | 8                                       | 2 486                  | 486                            |
|                    | Shikarpur                         | 11              | 0                     | 1 776                      | 103                                | -                        | -                                | 1                               | 0                                       | 1 788                  | 104                            |
|                    | South Kkarachi                    | -               | -                     | -                          | -                                  | -                        | -                                | -                               | -                                       | -                      | -                              |
|                    | Sujawal                           | -               | 2                     | -                          | 74                                 | -                        | -                                | -                               | 0                                       | 0                      | 77                             |
|                    | Sukkur                            | 142             | 0                     | 1 212                      | 1                                  | -                        | 0                                | 2                               | -                                       | 1 356                  | 1                              |
|                    | Tando allahyar                    | 311             | 0                     | 868                        | 8                                  | 4                        | 0                                | -                               | 0                                       | 1 184                  | 8                              |
|                    | Tando Muhammad khan               | 32              | 0                     | 1 111                      | 1                                  | 5                        | 0                                | 0                               | -                                       | 1 148                  | 1                              |
|                    | Tharparkar                        | 1               | 16                    | 154                        | 201                                | 5 712                    | 6                                | -                               | 23                                      | 5 867                  | 245                            |
|                    | Thatta                            | 38              | -                     | 3 198                      | -                                  | 512                      | -                                | 39                              | -                                       | 3 787                  | -                              |
|                    | umerkot                           | 23              | -                     | 1 603                      | 2                                  | 1 004                    | -                                | -                               | -                                       | 2 629                  | 2                              |
|                    | West KKarachi                     | 4               | -                     | 27                         | -                                  | 16                       | 0                                | -                               | -                                       | 48                     | -                              |
| <b>Total Sindh</b> |                                   | <b>2 162</b>    | <b>64</b>             | <b>40 885</b>              | <b>3 476</b>                       | <b>9 826</b>             | <b>73</b>                        | <b>107</b>                      | <b>45</b>                               | <b>52 981</b>          | <b>3 657</b>                   |
| Balochistan        | Awaran                            | 12              | -                     | -                          | -                                  | 451                      | -                                | -                               | -                                       | 463                    | -                              |
|                    | BarKhan                           | 108             | 0                     | 2                          | -                                  | 568                      | 2                                | -                               | -                                       | 678                    | 2                              |
|                    | Chagai                            | 7               | -                     | -                          | -                                  | 448                      | -                                | -                               | -                                       | 455                    | -                              |
|                    | Dera bugti                        | 4               | 0                     | 101                        | 0                                  | 2 182                    | 8                                | -                               | -                                       | 2 287                  | 8                              |
|                    | Gwadar                            | -               | -                     | -                          | -                                  | 196                      | -                                | -                               | -                                       | 196                    | -                              |
|                    | Harnai                            | 31              | -                     | 1                          | -                                  | 28                       | -                                | -                               | -                                       | 59                     | -                              |
|                    | Jaffarabad                        | 11              | 3                     | 2 093                      | 261                                | 145                      | 25                               | -                               | -                                       | 2 248                  | 289                            |
|                    | Jhal Magsi                        | 21              | 1                     | 698                        | 25                                 | 2 194                    | 2                                | -                               | -                                       | 2 913                  | 28                             |
|                    | Kachhi (Bolan)                    | 6               | 0                     | 477                        | 4                                  | 2 883                    | 1                                | 63                              | 8                                       | 3 430                  | 12                             |
|                    | Shaheed Sikandarabad Sikandarabad | -               | -                     | -                          | -                                  | -                        | -                                | -                               | -                                       | -                      | -                              |
| Kalat              | 35                                | -               | 0                     | -                          | 1 398                              | -                        | -                                | -                               | 1 433                                   | -                      |                                |

| Province | Districts                | Tree orchards   | Flooded tree orchards | Herbaceous crops irrigated | Flooded irrigated herbaceous crops | Herbaceous crops rainfed | Flooded herbaceous crops rainfed | Herbaceous crops in flood plain | Flooded herbaceous crops in flood plain | Total agriculture area | Total flooded agriculture area |
|----------|--------------------------|-----------------|-----------------------|----------------------------|------------------------------------|--------------------------|----------------------------------|---------------------------------|---|------------------------|--------------------------------|
|          |                          | km <sup>2</sup> | km <sup>2</sup>       | km <sup>2</sup>            | km <sup>2</sup>                    | km <sup>2</sup>          | km <sup>2</sup>                  | km <sup>2</sup>                 | km <sup>2</sup>                         | km <sup>2</sup>        | km <sup>2</sup>                |
|          | Kech                     | 0               | -                     | 104                        | -                                  | 265                      | -                                | -                               | -                                       | 369                    | -                              |
|          | Kharan                   | -               | -                     | -                          | -                                  | 822                      | -                                | -                               | -                                       | 822                    | -                              |
|          | Khuzdar                  | 73              | 0                     | 13                         | 0                                  | 1 323                    | -                                | -                               | -                                       | 1 409                  | 0                              |
|          | Chaman                   | -               | 0                     | -                          | -                                  | -                        | 1                                | -                               | -                                       | -                      | 1                              |
|          | Killa AbdullahAbdullah   | 132             | -                     | 1                          | -                                  | 470                      | -                                | -                               | -                                       | 603                    | -                              |
|          | Killa SaifullahSaifullah | 177             | 1                     | 2                          | 0                                  | 1 320                    | 2                                | -                               | -                                       | 1 499                  | 2                              |
|          | Kohlu                    | 29              | 1                     | 17                         | 0                                  | 495                      | 11                               | -                               | -                                       | 541                    | 13                             |
|          | Lasbela                  | 176             | -                     | 206                        | -                                  | 450                      | -                                | 328                             | -                                       | 1 159                  | -                              |
|          | Loralai                  | 214             | 6                     | 3                          | 0                                  | 960                      | 9                                | -                               | -                                       | 1 177                  | 15                             |
|          | Duki                     | -               | -                     | -                          | -                                  | -                        | -                                | -                               | -                                       | -                      | -                              |
|          | Mastung                  | 128             | 0                     | 2                          | -                                  | 854                      | 3                                | -                               | -                                       | 984                    | 3                              |
|          | Musakhel                 | 120             | 0                     | 1                          | -                                  | 269                      | 0                                | -                               | -                                       | 390                    | 0                              |
|          | Nasirabad                | 2               | 0                     | 2 094                      | 291                                | 1 314                    | 21                               | -                               | -                                       | 3 411                  | 312                            |
|          | Nushki                   | -               | -                     | -                          | -                                  | 1 001                    | -                                | -                               | -                                       | 1 001                  | -                              |
|          | Panjgur                  | -               | -                     | 81                         | -                                  | 666                      | -                                | -                               | -                                       | 748                    | -                              |
|          | Pishin                   | 202             | 0                     | 2                          | -                                  | 617                      | 1                                | -                               | -                                       | 821                    | 1                              |
|          | Quetta                   | 48              | 0                     | 1                          | -                                  | 265                      | 0                                | -                               | -                                       | 314                    | 0                              |
|          | Sherani                  | 31              | -                     | 0                          | -                                  | 48                       | 0                                | -                               | -                                       | 79                     | 0                              |
|          | Lehri                    | -               | 0                     | -                          | 1                                  | -                        | 4                                | -                               | 9                                       | -                      | 14                             |
|          | Sibi                     | 38              | -                     | 437                        | -                                  | 2 089                    | -                                | 55                              | -                                       | 2 618                  | -                              |
|          | Sohbatpur                | -               | -                     | -                          | -                                  | -                        | -                                | -                               | -                                       | -                      | -                              |
|          | Washuk                   | -               | -                     | -                          | -                                  | -                        | -                                | -                               | -                                       | -                      | -                              |
|          | Zhob                     | 85              | -                     | 0                          | -                                  | 901                      | 0                                | 2                               | -                                       | 989                    | 0                              |

| Province           | Districts                | Tree orchards   | Flooded tree orchards | Herbaceous crops irrigated | Flooded irrigated herbaceous crops | Herbaceous crops rainfed | Flooded herbaceous crops rainfed | Herbaceous crops in flood plain | Flooded herbaceous crops in flood plain | Total agriculture area | Total flooded agriculture area |
|--------------------|--------------------------|-----------------|-----------------------|----------------------------|------------------------------------|--------------------------|----------------------------------|---------------------------------|---|------------------------|--------------------------------|
|                    |                          | km <sup>2</sup> | km <sup>2</sup>       | km <sup>2</sup>            | km <sup>2</sup>                    | km <sup>2</sup>          | km <sup>2</sup>                  | km <sup>2</sup>                 | km <sup>2</sup>                         | km <sup>2</sup>        | km <sup>2</sup>                |
|                    | Ziarat                   | 101             | -                     | 3                          | -                                  | 41                       | -                                | -                               | -                                       | 145                    | -                              |
|                    | <b>Total Balochistan</b> | <b>1 789</b>    | <b>12</b>             | <b>6 340</b>               | <b>583</b>                         | <b>24 663</b>            | <b>90</b>                        | <b>448</b>                      | <b>16</b>                               | <b>33 241</b>          | <b>702</b>                     |
| Khyber pakhtunkhwa | Abbottabad               | 5               | -                     | 14                         | -                                  | 29                       | -                                | 14                              | -                                       | 61                     | -                              |
|                    | Bajaur                   | 0               | -                     | 66                         | -                                  | 203                      | -                                | 66                              | -                                       | 336                    | -                              |
|                    | Bannu                    | 54              | 0                     | 296                        | 0                                  | 331                      | 4                                | 2                               | -                                       | 684                    | 4                              |
|                    | Batagram                 | 0               | -                     | 3                          | -                                  | 72                       | 0                                | 5                               | 0                                       | 80                     | 0                              |
|                    | Buner                    | 3               | -                     | 85                         | 0                                  | 240                      | 0                                | 2                               | -                                       | 330                    | 0                              |
|                    | Charsadda                | 276             | 0                     | 414                        | 0                                  | 39                       | 0                                | 9                               | 1                                       | 738                    | 1                              |
|                    | Chitral lower            | -               | -                     | 0                          | -                                  | 150                      | 0                                | 154                             | 0                                       | 304                    | 0                              |
|                    | Chitral upper            | -               | -                     | -                          | -                                  | -                        | -                                | -                               | -                                       | -                      | -                              |
|                    | D. I. Khan               | 74              | 0                     | 1 480                      | 5                                  | 3 193                    | 1                                | 156                             | 2                                       | 4 903                  | 8                              |
|                    | Hangu                    | -               | -                     | 11                         | -                                  | 246                      | -                                | 15                              | -                                       | 272                    | -                              |
|                    | Haripur                  | 14              | 0                     | 72                         | 0                                  | 220                      | 0                                | 25                              | 0                                       | 331                    | 0                              |
|                    | Karak                    | 0               | -                     | 14                         | 0                                  | 710                      | 6                                | -                               | -                                       | 724                    | 6                              |
|                    | Khyber                   | 2               | -                     | 24                         | -                                  | 83                       | 0                                | 9                               | -                                       | 118                    | 0                              |
|                    | Kohat                    | 7               | -                     | 140                        | -                                  | 654                      | -                                | 16                              | -                                       | 817                    | -                              |
|                    | Kohistan Lower           | -               | -                     | -                          | -                                  | 60                       | 0                                | 12                              | 0                                       | 72                     | 0                              |
|                    | Kohistan Upper           | -               | -                     | -                          | -                                  | -                        | -                                | -                               | -                                       | -                      | -                              |
|                    | Kolai Palas Kohistan     | -               | -                     | -                          | -                                  | -                        | -                                | -                               | -                                       | -                      | -                              |
|                    | Kurram                   | -               | -                     | 16                         | -                                  | 191                      | -                                | 31                              | -                                       | 237                    | -                              |
|                    | Lakki Marwat             | 13              | 0                     | 174                        | 2                                  | 1 852                    | 49                               | 6                               | 0                                       | 2 045                  | 51                             |
|                    | Lower Dir                | 0               | -                     | 62                         | -                                  | 89                       | 0                                | 92                              | 0                                       | 243                    | 0                              |
|                    | Malakand                 | 48              | -                     | 97                         | -                                  | 52                       | -                                | 35                              | 0                                       | 231                    | 0                              |
|                    | Mansehra                 | 7               | -                     | 50                         | -                                  | 137                      | -                                | 51                              | -                                       | 245                    | -                              |

| Province | Districts        | Tree orchards   | Flooded tree orchards | Herbaceous crops irrigated | Flooded irrigated herbaceous crops | Herbaceous crops rainfed | Flooded herbaceous crops rainfed | Herbaceous crops in flood plain | Flooded herbaceous crops in flood plain | Total agriculture area | Total flooded agriculture area |
|----------|------------------|-----------------|-----------------------|----------------------------|------------------------------------|--------------------------|----------------------------------|---------------------------------|---|------------------------|--------------------------------|
|          |                  | km <sup>2</sup> | km <sup>2</sup>       | km <sup>2</sup>            | km <sup>2</sup>                    | km <sup>2</sup>          | km <sup>2</sup>                  | km <sup>2</sup>                 | km <sup>2</sup>                         | km <sup>2</sup>        | km <sup>2</sup>                |
|          | Mardan           | 245             | 0                     | 619                        | 1                                  | 171                      | 0                                | 0                               | -                                       | 1 035                  | 1                              |
|          | Mohmand          | 5               | -                     | 43                         | 0                                  | 492                      | 1                                | 0                               | -                                       | 540                    | 1                              |
|          | North Waziristan | 0               | -                     | 3                          | -                                  | 72                       | 0                                | 80                              | -                                       | 155                    | 0                              |
|          | Nowshera         | 107             | 1                     | 338                        | 10                                 | 165                      | 2                                | 28                              | 11                                      | 638                    | 23                             |
|          | Orakzai          | -               | -                     | 9                          | -                                  | 82                       | -                                | 4                               | -                                       | 96                     | -                              |
|          | Peshawar         | 151             | 18                    | 313                        | 13                                 | 163                      | 0                                | 4                               | -                                       | 631                    | 32                             |
|          | Shangla          | 0               | 0                     | 3                          | -                                  | 107                      | 0                                | 18                              | 0                                       | 128                    | 0                              |
|          | South Waziristan | 19              | -                     | 0                          | -                                  | 165                      | 4                                | 11                              | -                                       | 196                    | 4                              |
|          | Swabi            | 67              | 0                     | 657                        | 1                                  | 121                      | 1                                | 17                              | 0                                       | 862                    | 2                              |
|          | Swat             | 4               | -                     | 51                         | 0                                  | 170                      | 0                                | 148                             | 0                                       | 373                    | 1                              |
|          | Tank             | -               | -                     | 130                        | 0                                  | 791                      | 1                                | -                               | -                                       | 922                    | 1                              |
|          | Tor Ghar         | 0               | 0                     | 1                          | -                                  | 9                        | 0                                | 5                               | 0                                       | 15                     | 0                              |
|          | Upper Dir        | -               | -                     | 2                          | -                                  | 91                       | 0                                | 27                              | 0                                       | 120                    | 0                              |
|          | <b>Total KP</b>  | <b>1 102</b>    | <b>19</b>             | <b>5 187</b>               | <b>32</b>                          | <b>11 150</b>            | <b>69</b>                        | <b>1 042</b>                    | <b>15</b>                               | <b>18 481</b>          | <b>135</b>                     |
| Punjab   |                  | 4 546           | 0                     | 92 766                     | 0                                  | 27 240                   | 0                                | 2 960                           | 0                                       | 31 052 702             | 0                              |

Source: GAUL, WFP. 2015. *Global Administrative Boundaries - Provinces, Gaul 2015*. [https://geonode.wfp.org/layers/geonode:admin\\_2\\_gaul\\_2015/metadata\\_detail](https://geonode.wfp.org/layers/geonode:admin_2_gaul_2015/metadata_detail).  
Map conforms to UN Geospatial. 2020. *Map of Pakistan*. <https://www.un.org/geospatial/content/pakistan>

# A rapid geospatial flood impact assessment in **Pakistan**, 2022

In 2022, intense rainfall in monsoon season caused severe flooding across Pakistan and impacted a large number of people and households including deaths of people, damages of infrastructure (including roads, dams, buildings, electricity poles etc.), destruction of agricultural area and push millions of people into poverty and hunger.

In this context, the Food and Agriculture Organization of the United Nations (FAO) conducted a rapid geospatial impact assessment of floods on agricultural land, crop types and the exposure of people to floods during the period 1–31 August 2022 and extended to

1–19 September 2022. This assessment was conducted for four provinces of Pakistan including Punjab, Sindh, Khyber Pakhtunkhwa and Balochistan and provides information on flood extent, impacted agricultural area, impacted crop type area and people exposure to floods at both provincial and district levels.

With recent advances in geospatial and information technologies and updated land cover maps, crop specific information adapted to national conditions with tailored field campaigns are expected to better support response programmes and agricultural development as well as to support emergency response programmes in the future.

## **Contact:**

**Geospatial Unit, Land and Water (NSL) Division**

Email address: [GIS-manager@fao.org](mailto:GIS-manager@fao.org)

Website: <https://www.fao.org/geospatial/en/>

Food and Agriculture Organization of the United Nations  
Rome, Italy.

**FAO Representation in Pakistan**

Email address: [FAO-PK@fao.org](mailto:FAO-PK@fao.org)

Website: <https://www.fao.org/pakistan/en/>

Food and Agriculture Organization of the United Nations  
Islamabad, Pakistan.

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