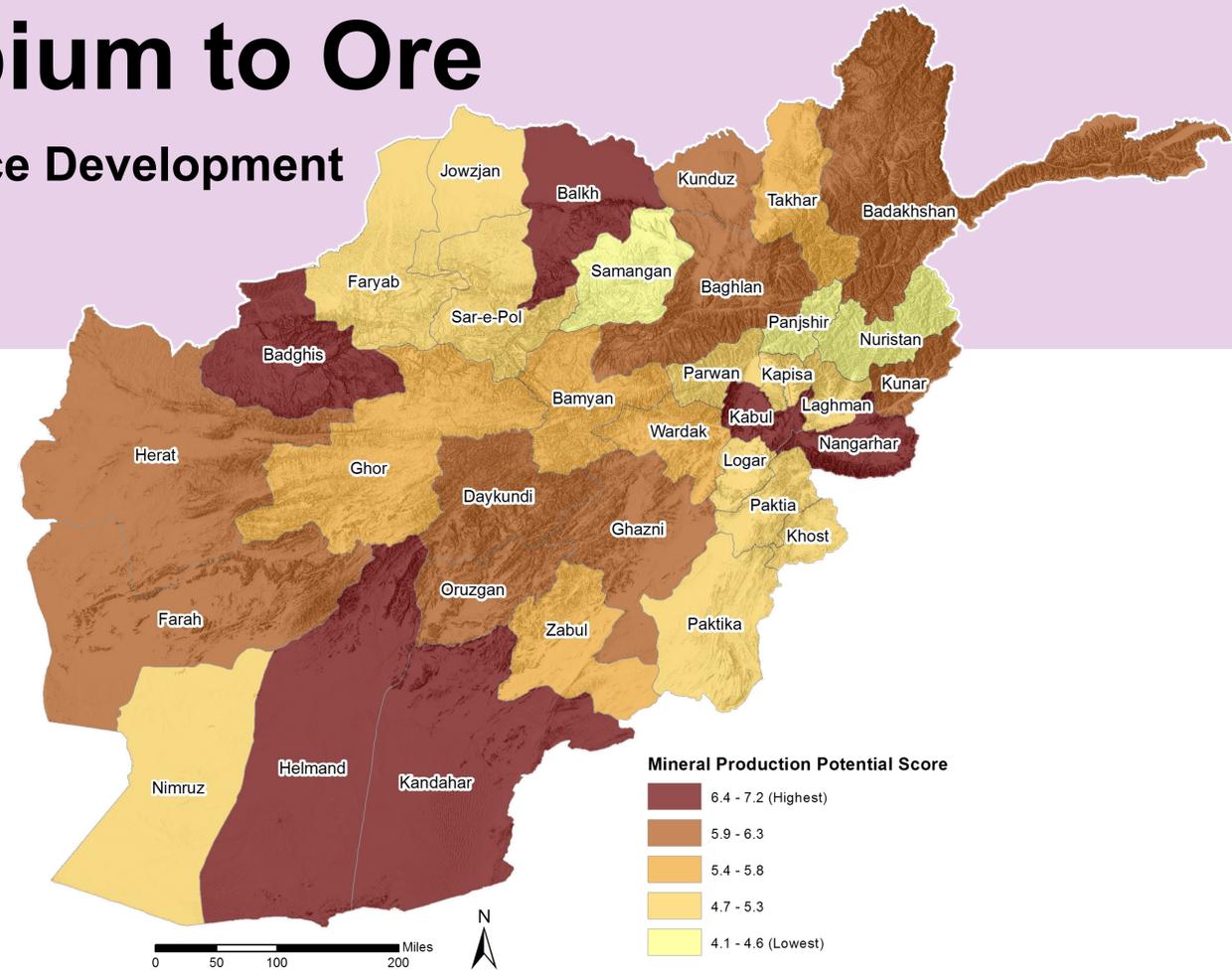




# Afghanistan: From Opium to Ore

## Economic Stability through Mineral Resource Development



**Introduction** Eastern Afghanistan lies at the western end of the Himalayan Mountains, which formed around 50 million years ago when the Indian Plate collided with the Eurasian Plate. Afghanistan's complex geologic history created the conditions for an abundance and variety of minerals. Afghanistan contains some of the oldest known mines in the world that produced lapis lazuli used by the Egyptian Pharaohs. There are over 1,400 mineral occurrences recorded to date in Afghanistan.

In 2004 the USGS began working with the Afghan government to help assess natural resources and to assist in the rebuilding of its earth science organizations. The USGS projects in Afghanistan lasted until late 2014, and resulted in a wealth of mineral data for the country, and it is estimated that Afghanistan could have a mineral potential of up to three trillion dollars.

Currently, Afghanistan's main source of revenue is opium and it is also the global leader in illicit opium production; producing about 70% (3,300 tons) of the world's total opium, according to the 2016 World Drug Report by UNODC. Civil war has ravaged Afghanistan for decades and has caused great economic instability and poverty. For many of the country's farmers, cultivation of opium poppy has been their only option to try to regain economic stability.

Making the switch from opium poppy cultivation to mineral production would not only bring more jobs to the country, it would also require more skilled workers. This need for skilled workers would in turn cause an increased demand for education. Better jobs and more educated workers would not only benefit individual families and villages, but the country of Afghanistan as a whole.

**Goals & Methods** The goal of this project was to determine the provinces best suited to encourage the switch from opium poppy cultivation to mineral production. Several factors were taken into consideration.

- **Province Scale Factors:** Province scale data for **Population** (Map 1) and **Poppy Cultivation** (Map 2) were reclassified from 1 to 10, with 10 being the highest value and 1 being the lowest. **Education** data (Map 3) was reclassified from 7 to 10, with 7 having the fewest universities and 10 having the most. The values of 7 to 10 were used in order to emphasize the importance of education throughout the country.
- **Distance Factors:** Proximity to **Existing Mines** (Map 4), **Roads** (Map 5), **Rivers** (Map 6), and **USGS Mineral Areas of Interest** (Map 7) were processed using the Euclidian Distance tool. All distance data was then reclassified from 1 to 10, with 10 being the shortest distance, and 1 being the longest distance to each respective factor.

To achieve the final result; the Raster Calculator was used to add all 4 of the **distance** factors and then divide by 4. The Raster Calculator was again used to add all 3 of the **province scale** factors and divide by 3. Finally, the Raster Calculator was used to add the **distance** and **province** outputs and divide by 2. For the final map, the Zonal Statistics feature was used to overlay the province layer with the final output raster.

- **Helmand**, which has the country's highest poppy cultivation rate and close proximity to USGS mineral areas of interest.
- **Nangarhar**, which scored high in all criteria.

**Conclusion** This project is by no means a recommendation for Afghanistan to make the switch from opium poppy cultivation to mineral production immediately. Until the country has more stability and less corruption in government, the switch to mineral production would only serve to exploit the most vulnerable populations of Afghanistan further. A stable government is required to put into effect laws and regulations that will both promote the safety of the workers, and ensure that the mineral revenue is fairly distributed to be of the greatest benefit to the people of Afghanistan.

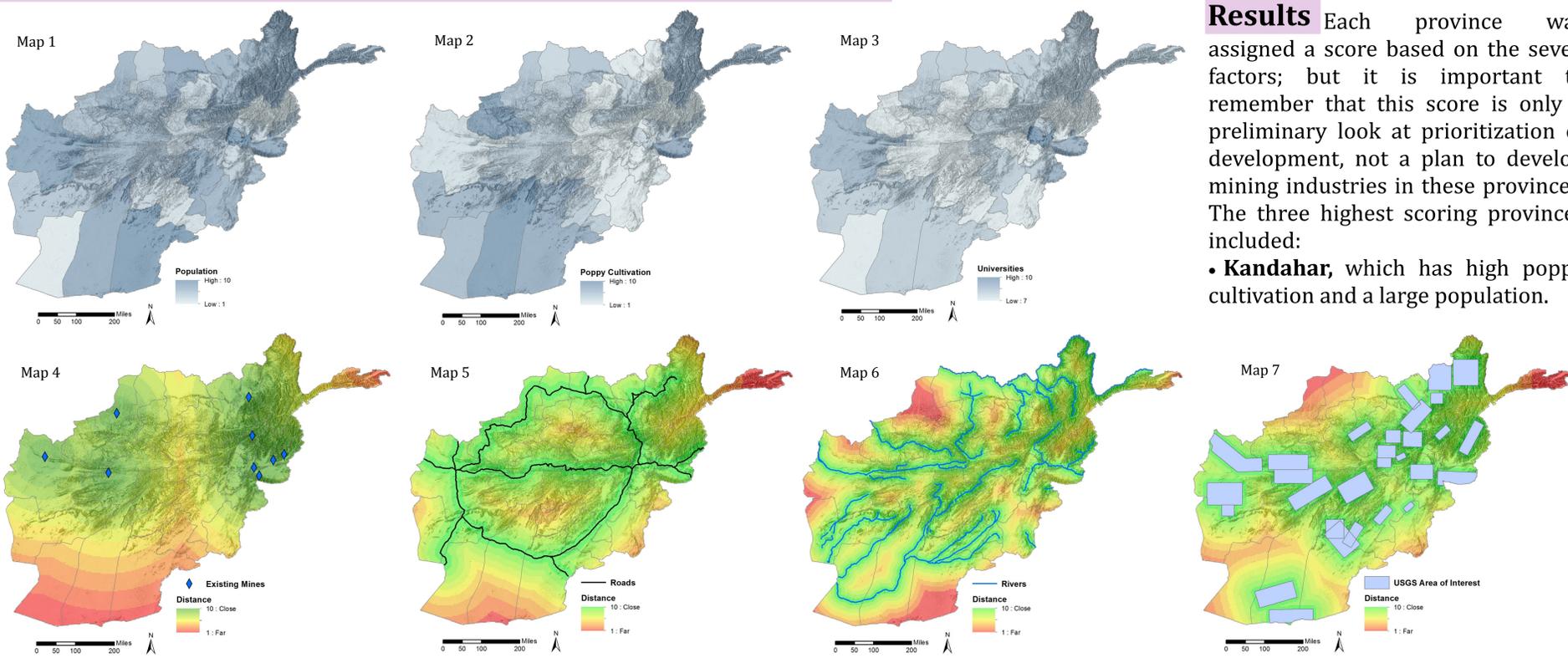
The extreme complexities of Afghanistan's current status must be resolved before any move to mineral production could be realized. However, one day the Afghan people may be able to implement a safe and productive mining industry, which will not only bring great wealth, but also a greater opportunity for education.

**References:**  
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**Data Sources:**  
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 Afghanistan - Water Courses. Humanitarian Data Exchange. <https://data.humdata.org/dataset/afghanistan-water-courses>  
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 Picture: <https://easternawareness.files.wordpress.com/2014/01/poppies-and-mountains.jpg>

**Cartographer:** Jessica Graham, EOS 104, Spring 2017  
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**Projected Coordinate System:** WGS 1984 World Mercator (Meters).



### Seven Criteria Used to Determine Mineral Production Potential



**Results** Each province was assigned a score based on the seven factors; but it is important to remember that this score is only a preliminary look at prioritization of development, not a plan to develop mining industries in these provinces. The three highest scoring provinces included:

- **Kandahar**, which has high poppy cultivation and a large population.