Renewable Energy Resource mapping in Pakistan

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ASTAE
Asia Sustainable and Alternative Energy Program

ESMAP
Energy Sector Management Assistance Program

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PROJECT OUTLINE

Background

- Implemented by The World Bank with grants from Energy Sector Management Assistance Program (ESMAP) and Asia Sustainable and Alternative Energy Program (ASTAE)
- Part of a global initiative covering 12 countries
- Pakistan is the largest program

Objectives

- Strategic level resource mapping to support government planning and commercial development
- Open data and full methodological transparency

Scope

- Started in early 2014
- Budget of US$4.7 million
- Covers biomass, solar and wind mapping
- Modeling plus ground-based data collection

SUPPORTING PROJECT DEVELOPMENT & BANKABILITY

- **Phase 1 outputs can be used for site scoping and planning – but margin of error is relatively high**
- **Phase 2 outputs can be used for calibration and as reference data**
- **Phase 3 outputs will be usable as primary or secondary source for project feasibility studies, with substantially reduced margin of error**

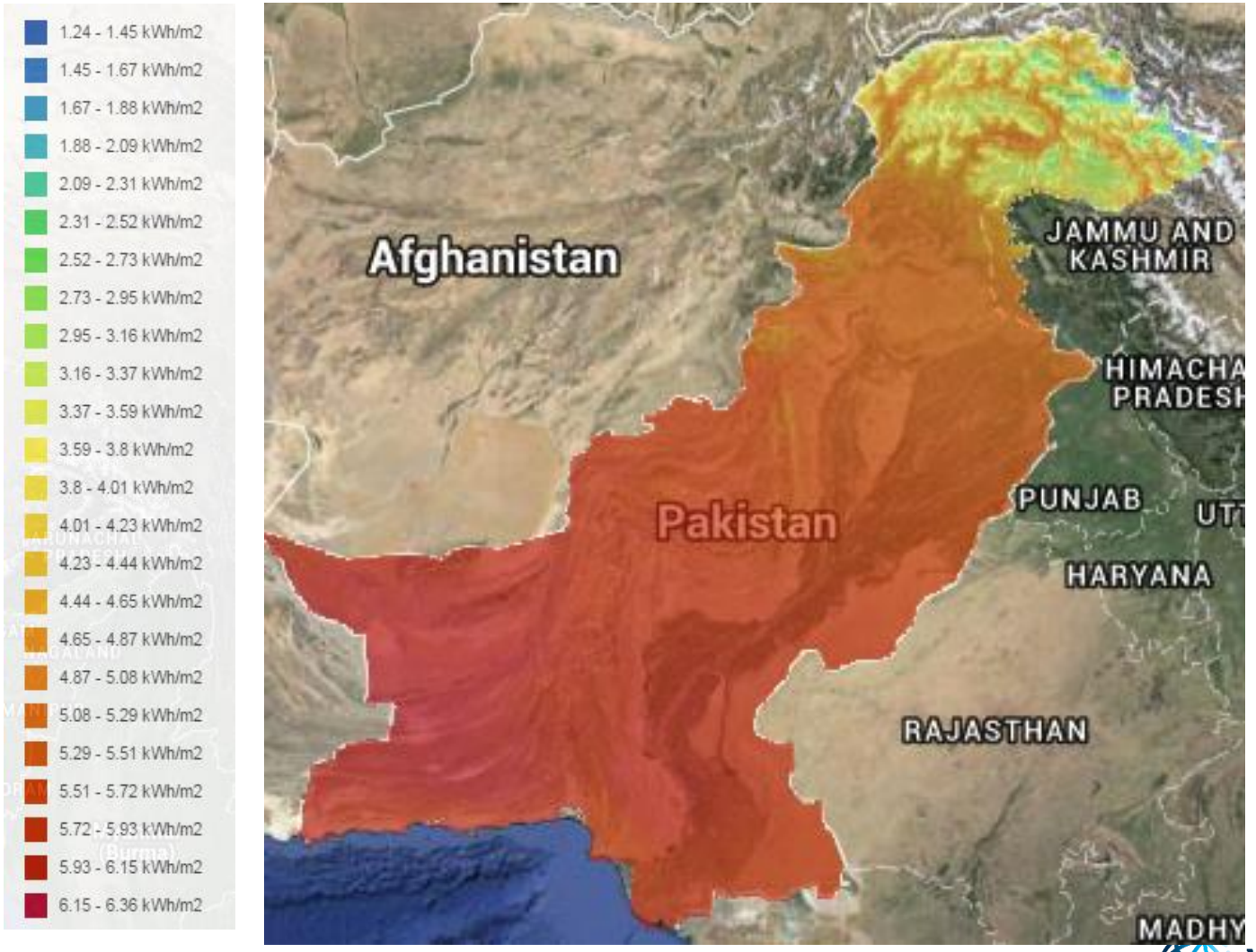
www.esmap.org/re_mapping_pakistan

Solar Mapping

- **Phase 1: Preliminary modeling outputs available online**
- **Phase 2: Started in November 2014, Nine sites**
- **Phase 3: Final solar atlas will be published early 2017**

Site	Type	Commission Date
Quaid-e-Azam Solar Park, Bahawalpur	Tier 1	Oct 2014
National University of Sciences and Technology, Islamabad	Tier 1	Nov 2014
Muhammad Nawaz Sharif University of Engineering & Technology, Multan	Tier 2	Nov 2014
University of Engineering and Technology, Kala Shah Kaku Campus	Tier 2	Nov 2014
NED University of Engineering and Technology, Karachi	Tier 2	Apr 2015
Mehran University of Engineering and Technology, Jamshoro	Tier 2	Apr 2015
University of Engineering and Technology, Peshawar	Tier 2	Apr 2015
Balochistan University of Information Technology, Engineering and Management Sciences, Quetta	Tier 2	Sep 2015
Balochistan University of Engineering and Technology, Khuzdar	Tier 2	Sep 2015

HIGH SOLAR POTENTIAL



Multi-year mean (2000-2012) of daily Global Horizontal Irradiance (GHI) for Pakistan in kWh/m2 (preliminary and unvalidated result)

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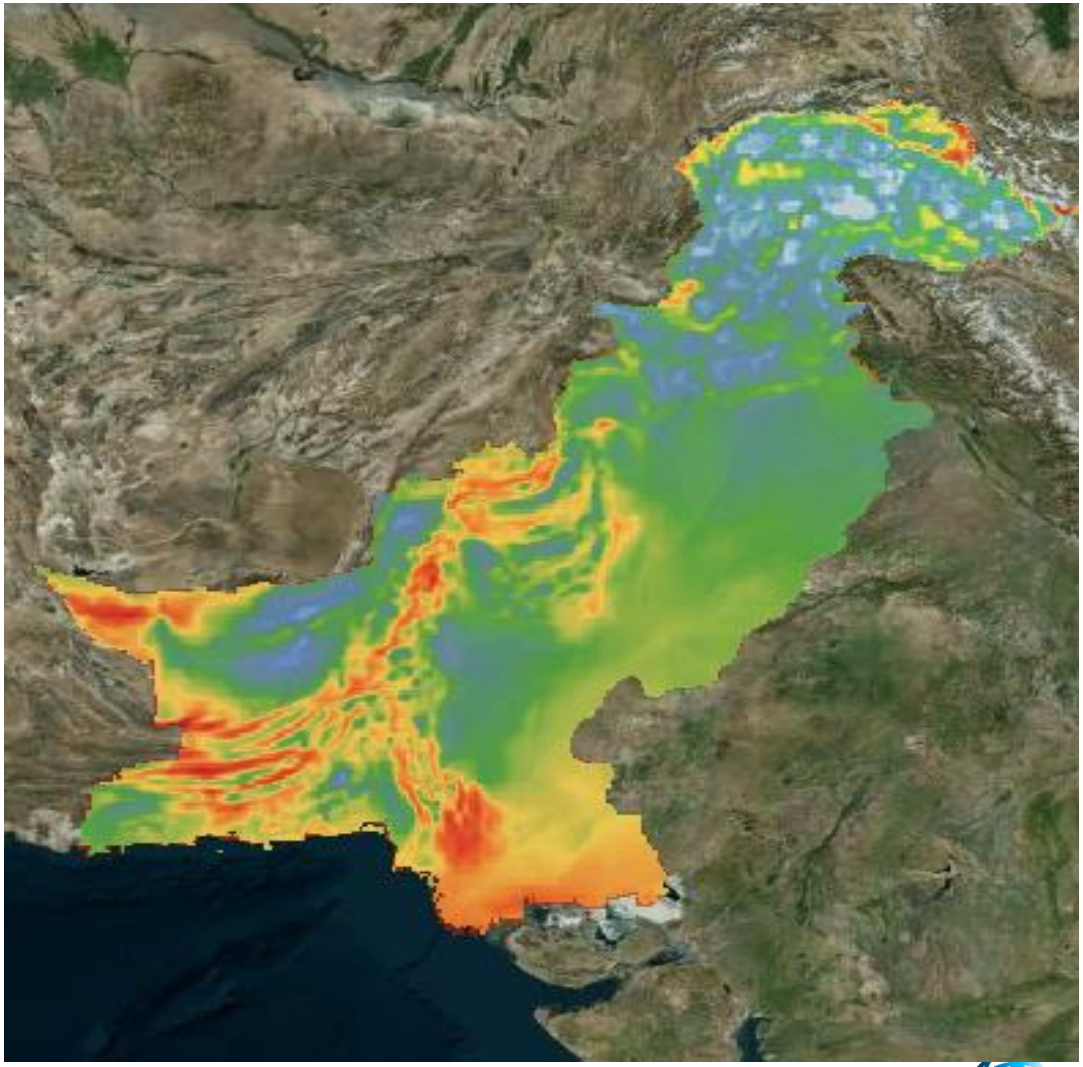
WIND MAPPING

- **Phase 1: Preliminary modeling outputs available online**
- **Phase 2: For model validation, 12 sites have been finalized in consultation with stakeholders; installation of wind masts started**
- **Phase 3: Final wind atlas by end-2018**

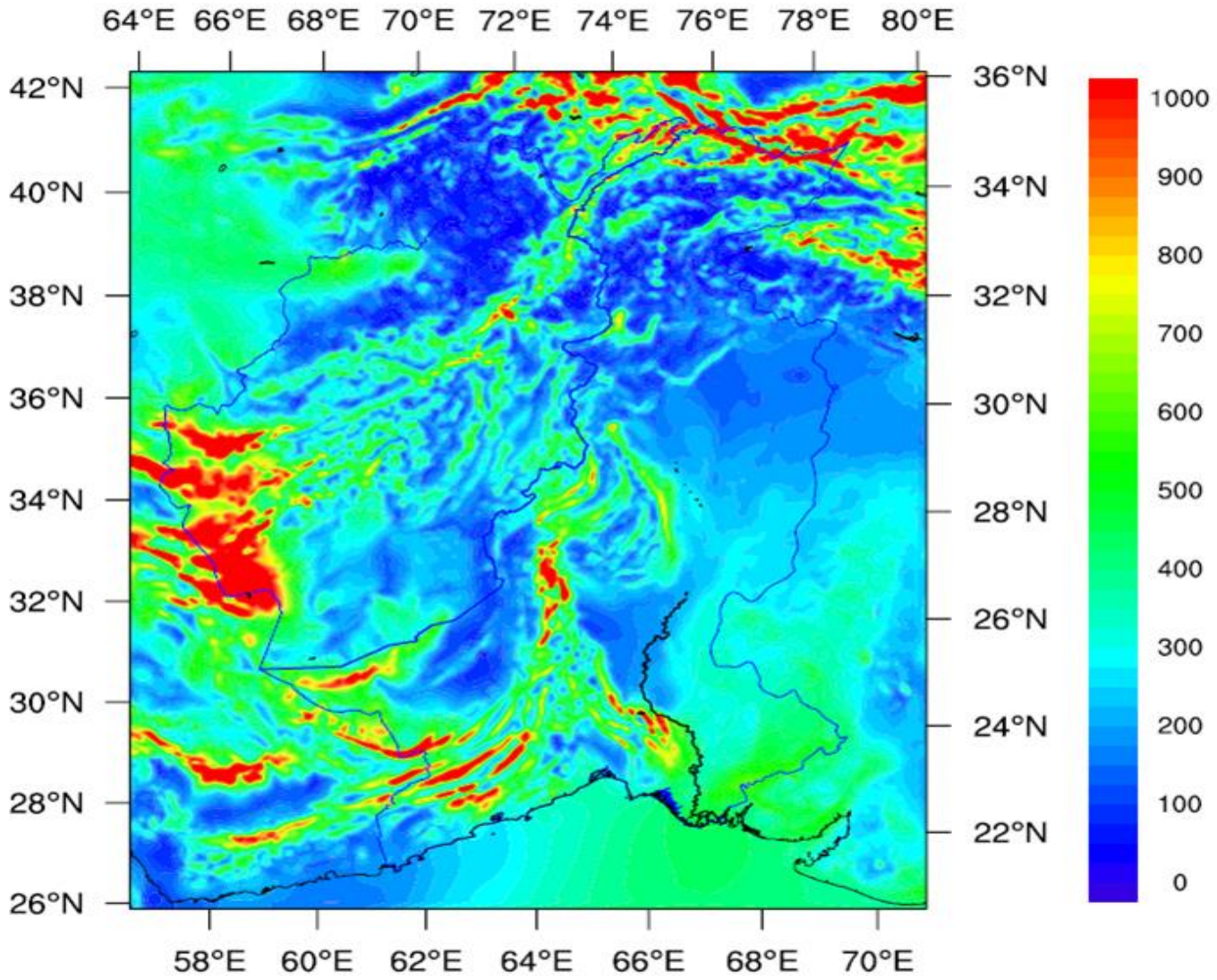
S. #	Site Name
1	Q A Solar Park, District Bahawalpur
2	Sadiqabad, District Rahim Yar Khan
3	Puttral Morr, Chakri, District Rawalpindi
4	Quaidabad, District Khushab
5	Shahabad, District Sajawal
6	Kandiari, Sanghar
7	Site in Umarkot OR Mirpur Khas
8	Tandu Ghulam Ali, Badin
9	UET Jalozai Campus, Nowshera
10	Do Nali, Haripur
11	BUITEMS, Quetta
12	Gwadar

EXCELLENT WIND RESOURCE IN MANY LOCATIONS



Mean simulated wind speed (m/s) in Pakistan at 100m above ground level based on 10 years of simulations

VERY HIGH WIND RESOURCE IN WESTERN AFGHANISTAN



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Biomass Mapping

- **Phase 1: Project began in Nov 2014**

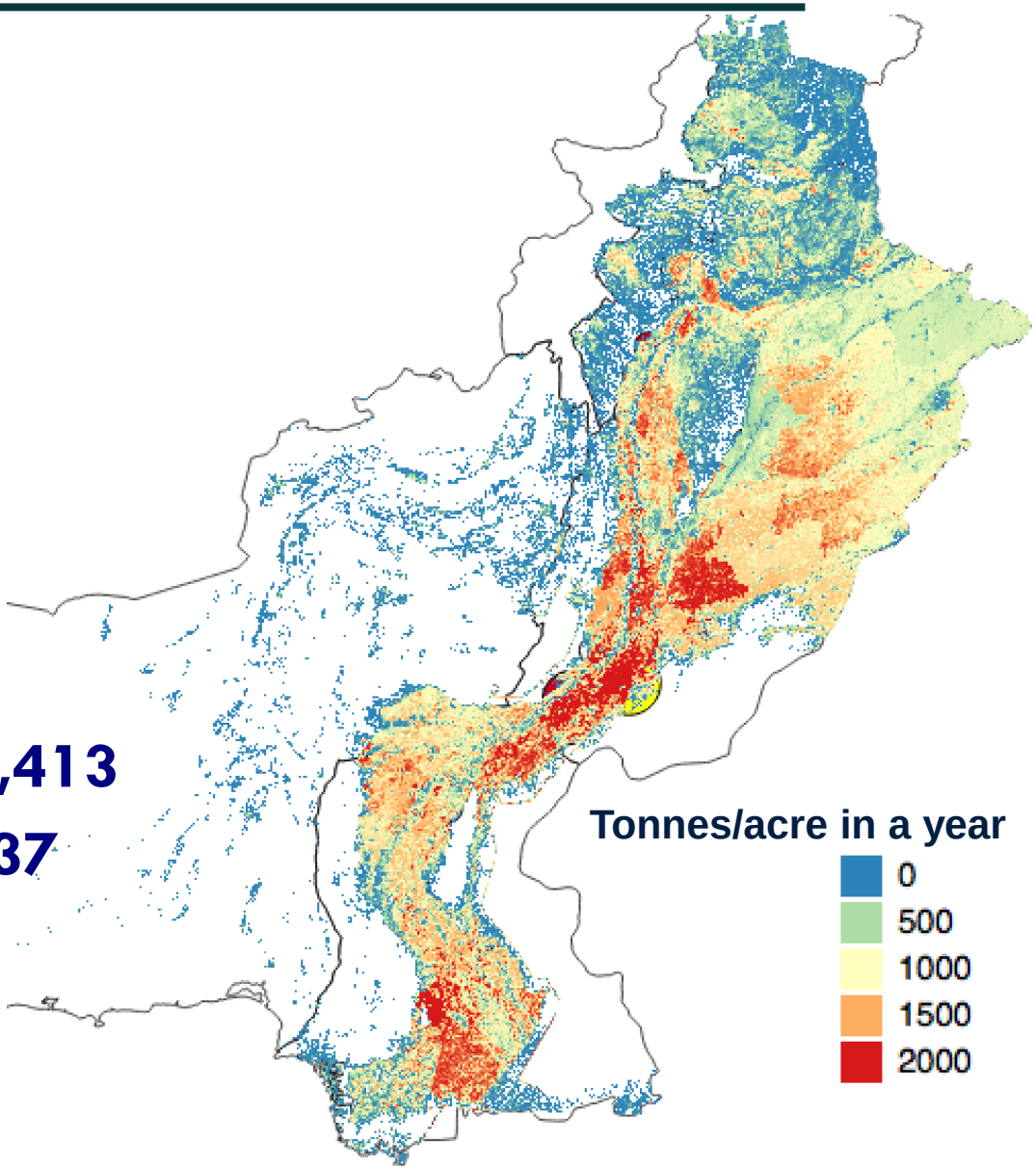
- **Phase 2: Field surveys completed in October 2015 in 44 target districts.**

- **Phase 3:**
  - **Validation of satellite data with field data in Nov 2015**
  - **Final biomass atlas ready workshops held in Islamabad, Lahore and Karachi (15-18 Feb)**
  - **Biomass Atlas Report in May 2016**

Theoretical Feedstock Potential

(x1000 tonnes/year)

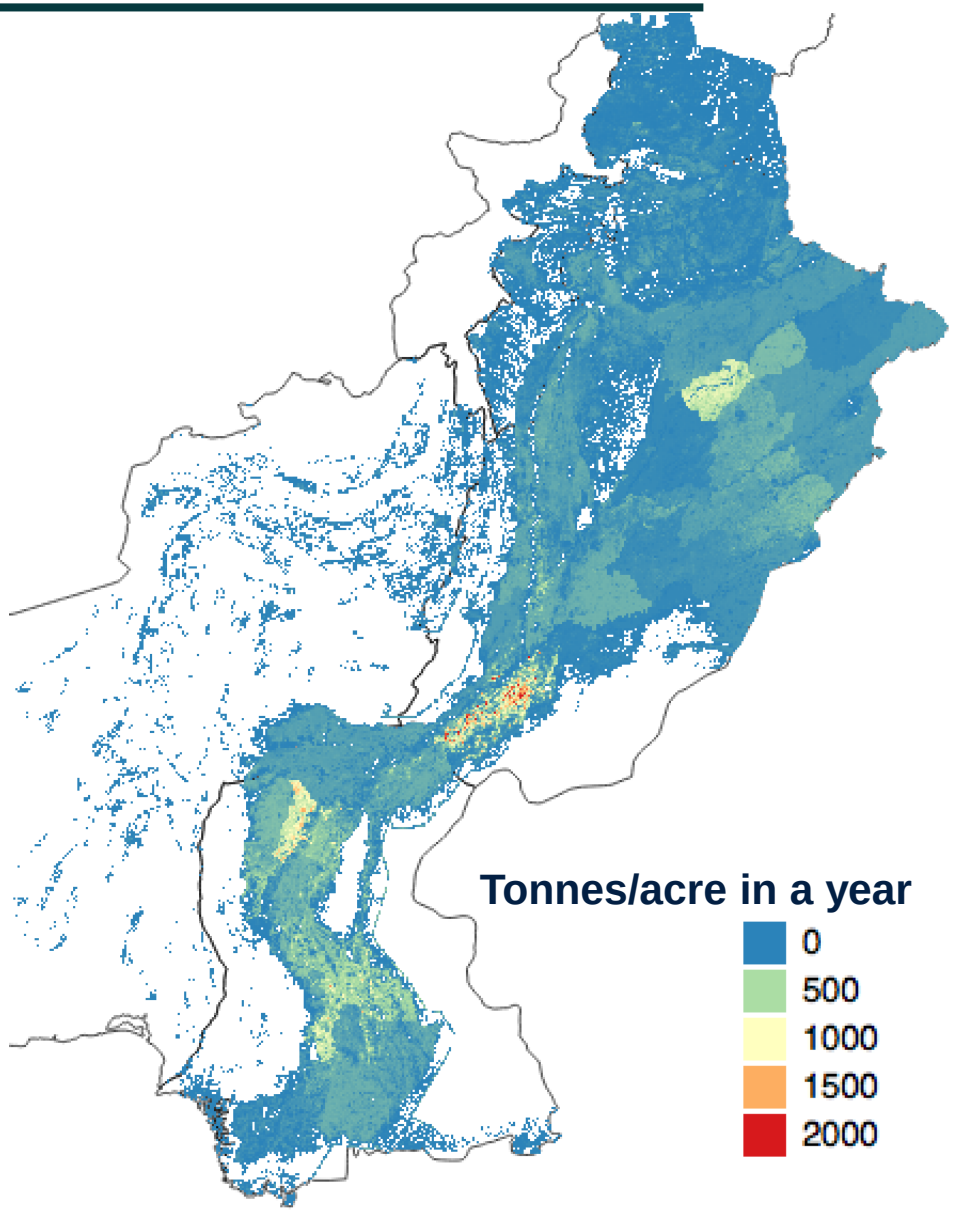
- Industrial:
  - Maize husk: 526
  - Rice husk: 4,360
  - Corn cob: 789
  - Bagasse: 11,031
- Field:
  - Rice straw: 21,800
  - Sugarcane trash: 4,413
  - Wheat straw: 52,337
  - Cotton stalk: TBD
  - Maize stalk: 2,988



Technical Feedstock Potential

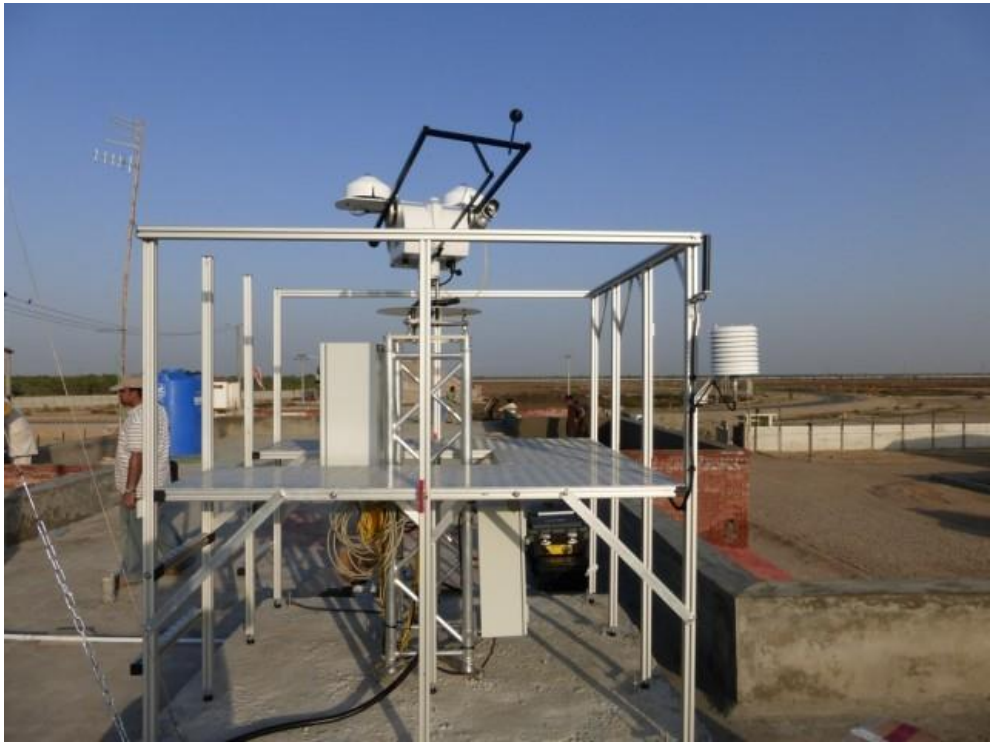
(x1000 tonnes/year)

- Industrial:
  - Maize husk: 57
  - Rice husk: 1,841
  - Corn cob: 86
  - Bagasse: 3,915
- Field:
  - Rice straw: 9,203
  - Sugarcane trash: 1,566
  - Wheat straw: 8,260
  - Cotton stalk: TBD
  - Maize stalk: 327



SOLAR MEASUREMENT CAMPAIGN: TIER 1

National University of Sciences and Technology, Islamabad



Quaid-e-Azam Solar Park, Bahawalpur

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SOLAR MEASUREMENT CAMPAIGN: TIER 2

Mehran University of Engineering and Technology, Jamshoro

University of Engineering and Technology, Peshawar

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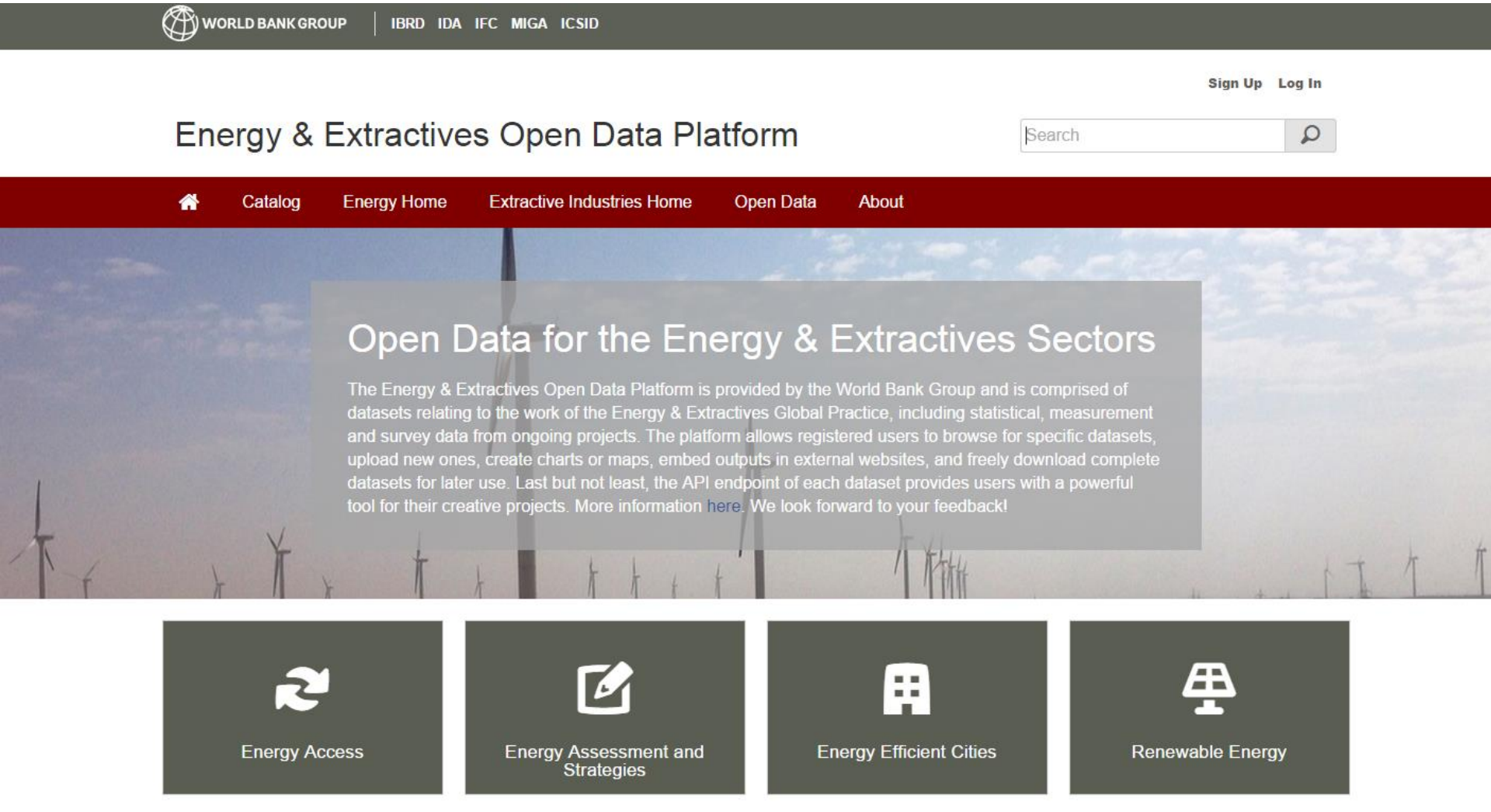
OPEN DATA PLATFORM

https://databox.worldbank.org/



Further information

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