



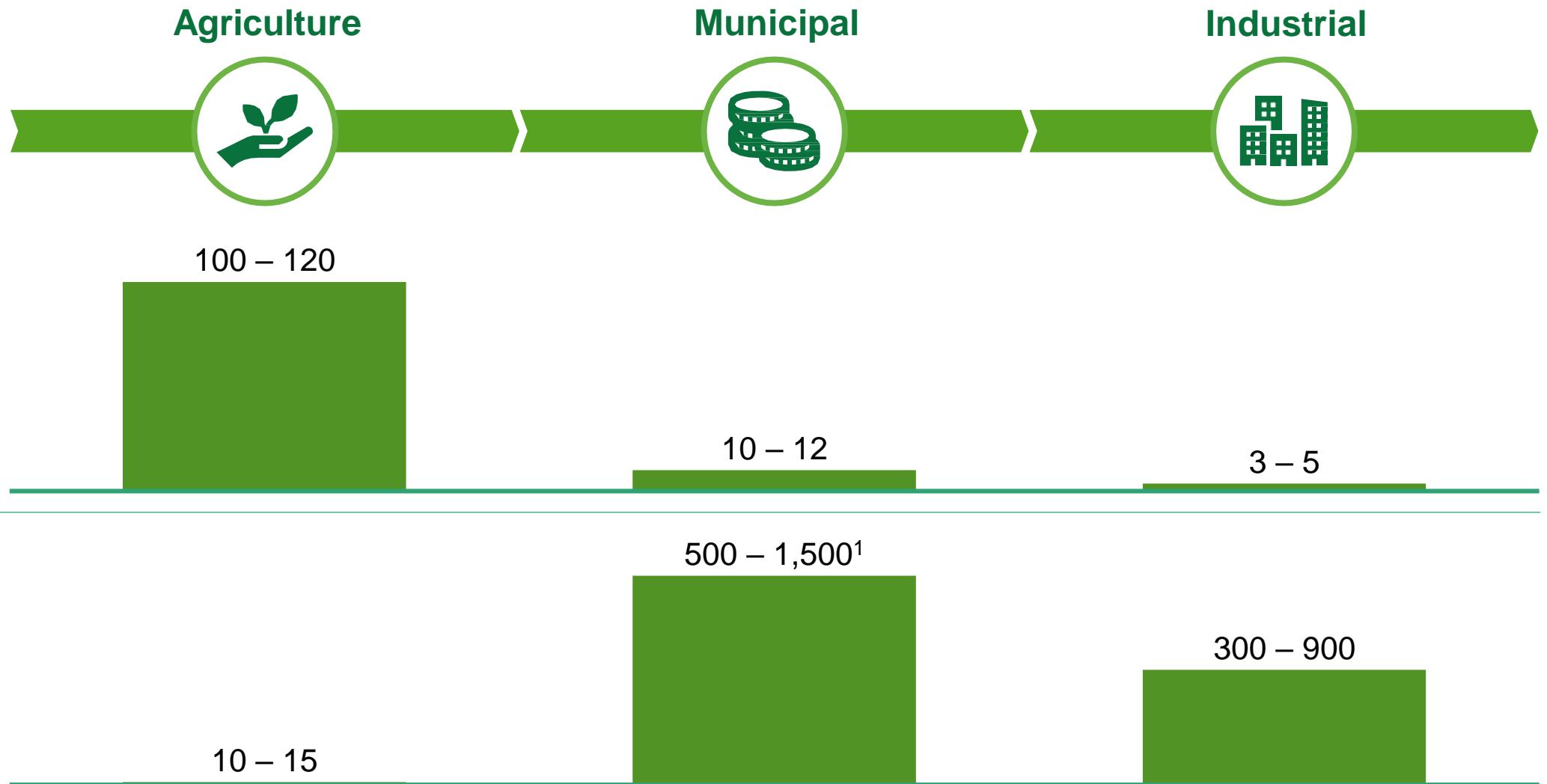
Water in Pakistan: Challenges and Potential Solutions

Presented by Ghias Khan

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Overview: 92% of Pakistan's water is deployed in Agriculture, although this only generates ~1% of water revenue



¹ Includes revenue for the government and private tankers

Source: UNDP, World Bank JICA, Provincial Budget Documents, Pakistan Bureau of Statistics, Survey of Pakistan 2017, KWSB, WASA Faisalabad, WASA Rawalpindi, WASA Multan, Urban Policy Unit – KPK, CDC Islamabad, PSLM



Challenges in the water sector

Potential solutions



Three critical water-related issues in Pakistan are shortage, inefficiency, and quality

Shortage



20-30

billions of gallons per day shortfall of water, equivalent to 15% of demand

Inefficiency



8-10X

higher agricultural value-add per gallon of water in China and Korea vs. Pakistan

Quality



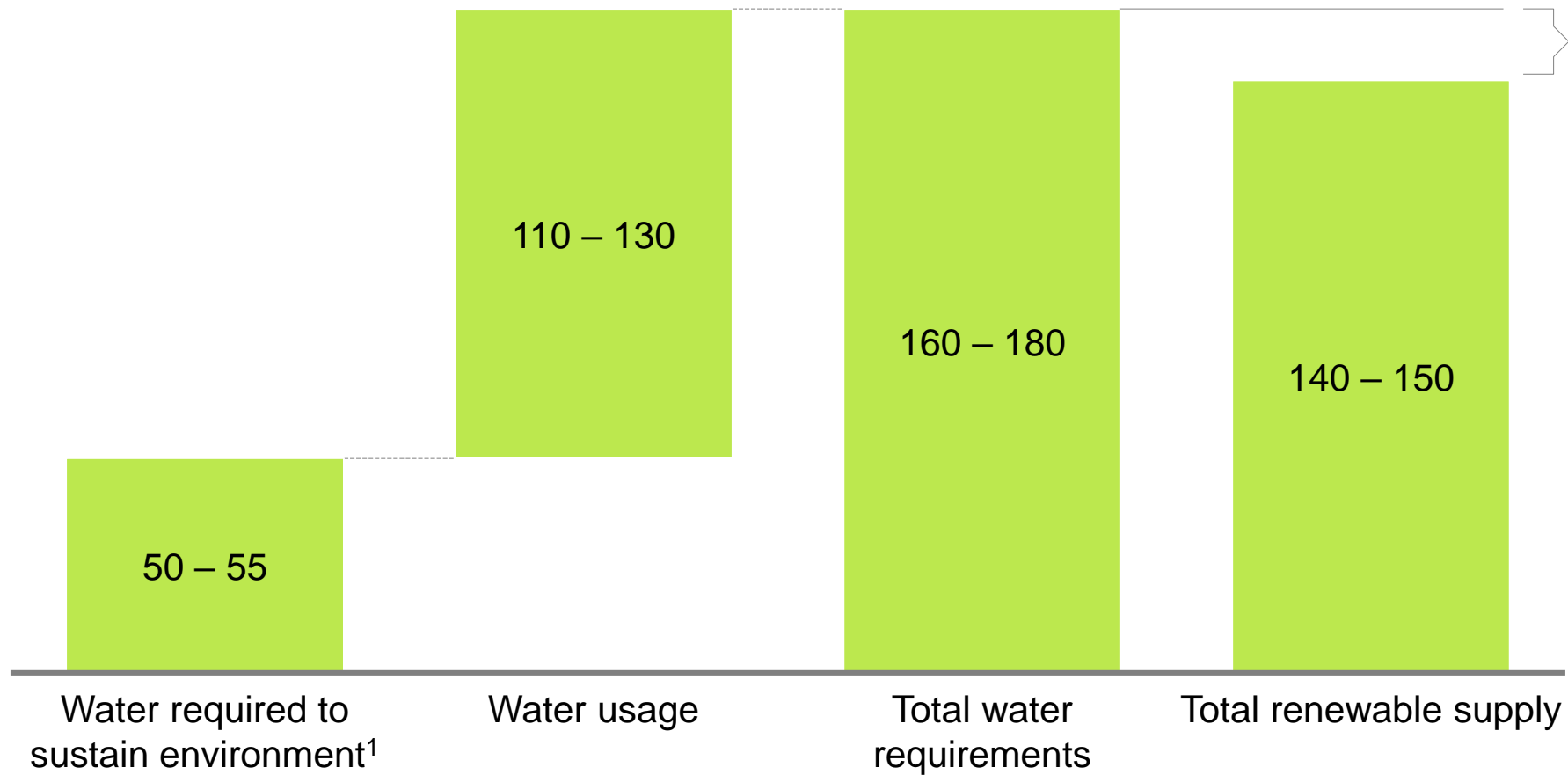
>30%

of diseases in Pakistan due to contaminated water consumption



Pakistan's shortfall is 20-30 billion gallons per day, or ~15% of total demand

Pakistan renewable water usage and supply, 2018, Billions of gallons per day



Shortage of 20–30 BGD – some of it is met through underground water resources which are quickly depleting

¹ Water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and well being that depend on these ecosystems

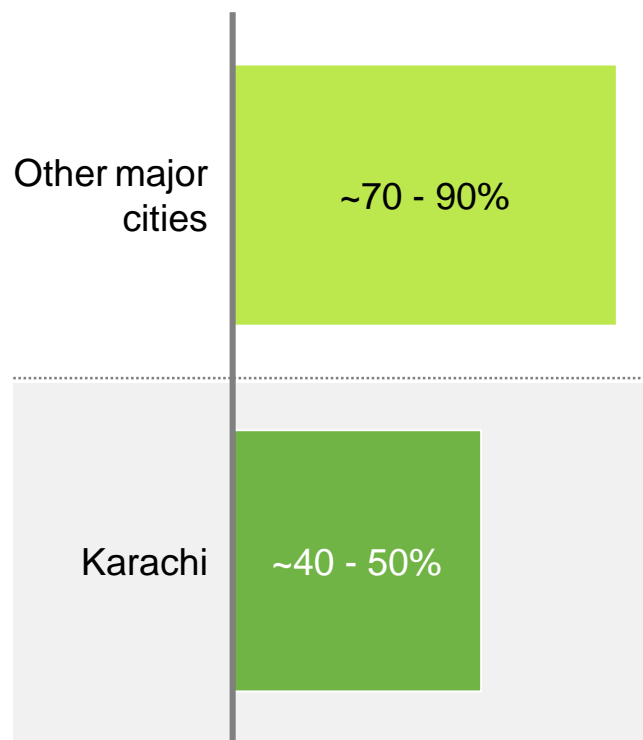
Source: Aquastat (FAO/UN), The Environment and Climate Change Outlook of Pakistan, Expert input, Press search



Most cities meet municipal and industrial demand, except Karachi which faces a 40-50% deficit

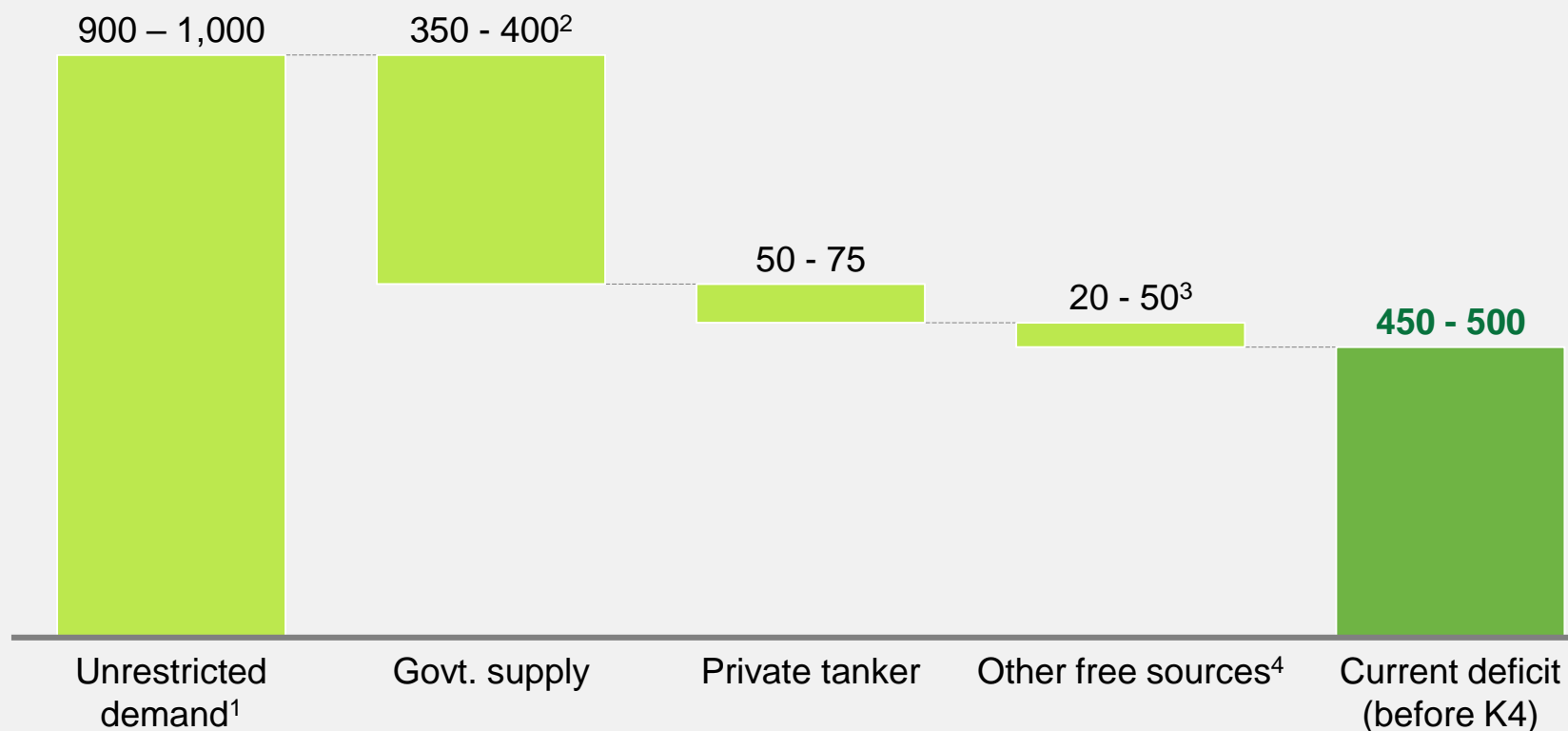
Most cities meet water demand ...

Supply as proportion of unrestricted demand¹, 2018, %



... except Karachi which faces a significant deficit

Water supply by source, 2018, Millions of gallons per day



¹ Unrestricted municipal demand is calculated based on water requirement of ~54 gallons per capita per day (benchmark based on United Nations guidelines, Safe Water organization guidelines & peer analysis)

² Excludes supply to industries, supply through tankers, leakages and theft

³ ~10% of total municipal supply in Karachi is from other sources as per Household Integrated Survey 2013-14

⁴ Includes bores, hand pump, motorized pump, well, river/stream/canal and others

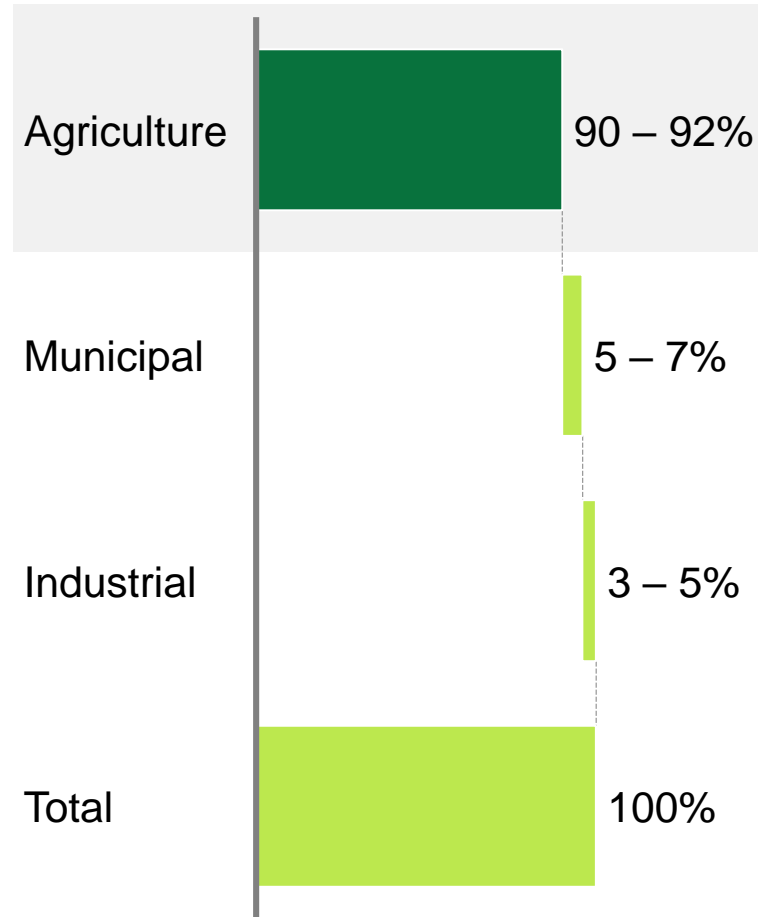
Source: KWSB, WASA, Urban Unit; Household Integrated Economic Survey 2013-14, Expert input, Karachi Water And Sewerage Services Improvement Project, United Nations, Press search



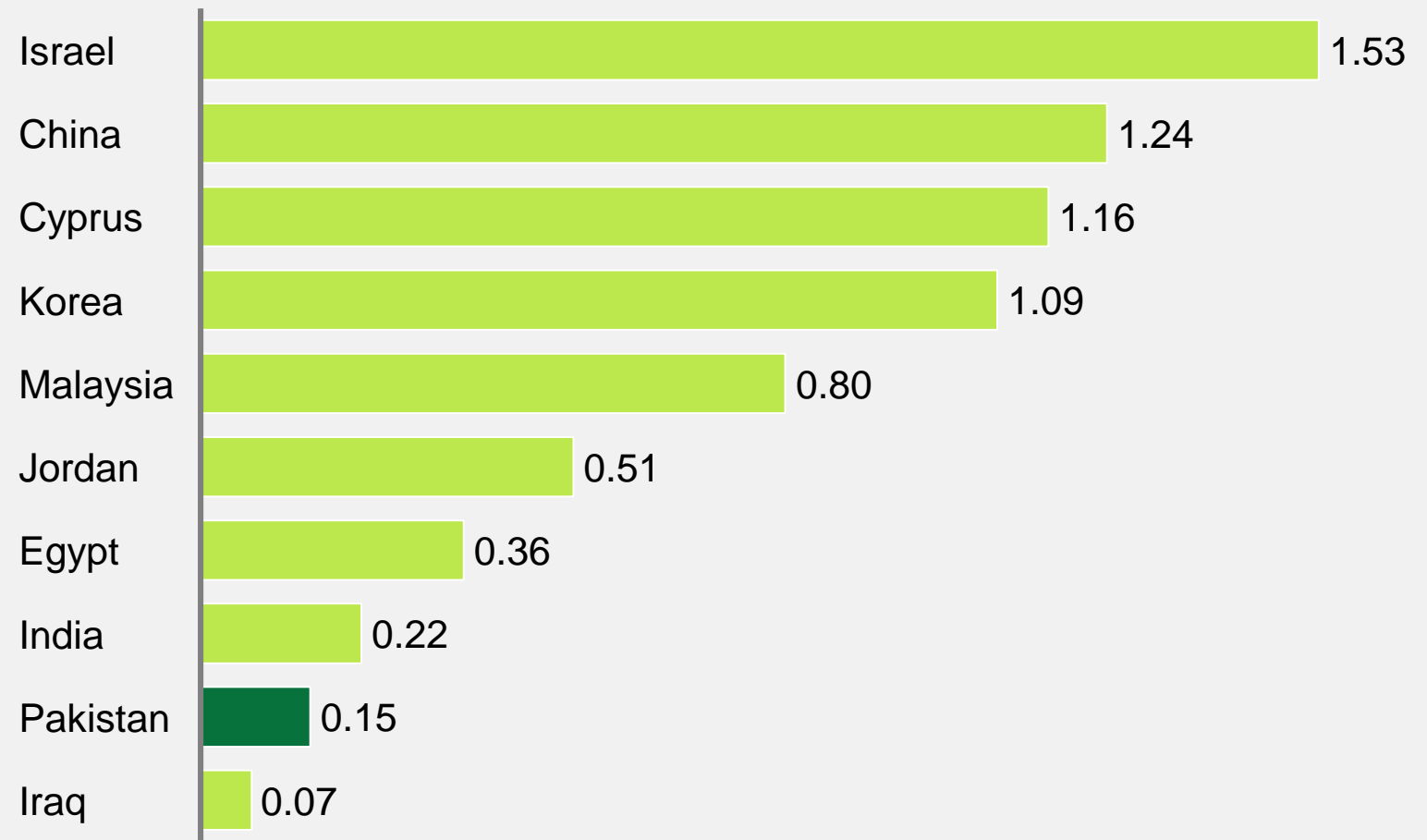
Water efficiency in other countries is up to 8-10X that of Pakistan

Water usage in Pakistan, 2018,

%



Agriculture value add per unit of water, 2018, PKR value add per gallon

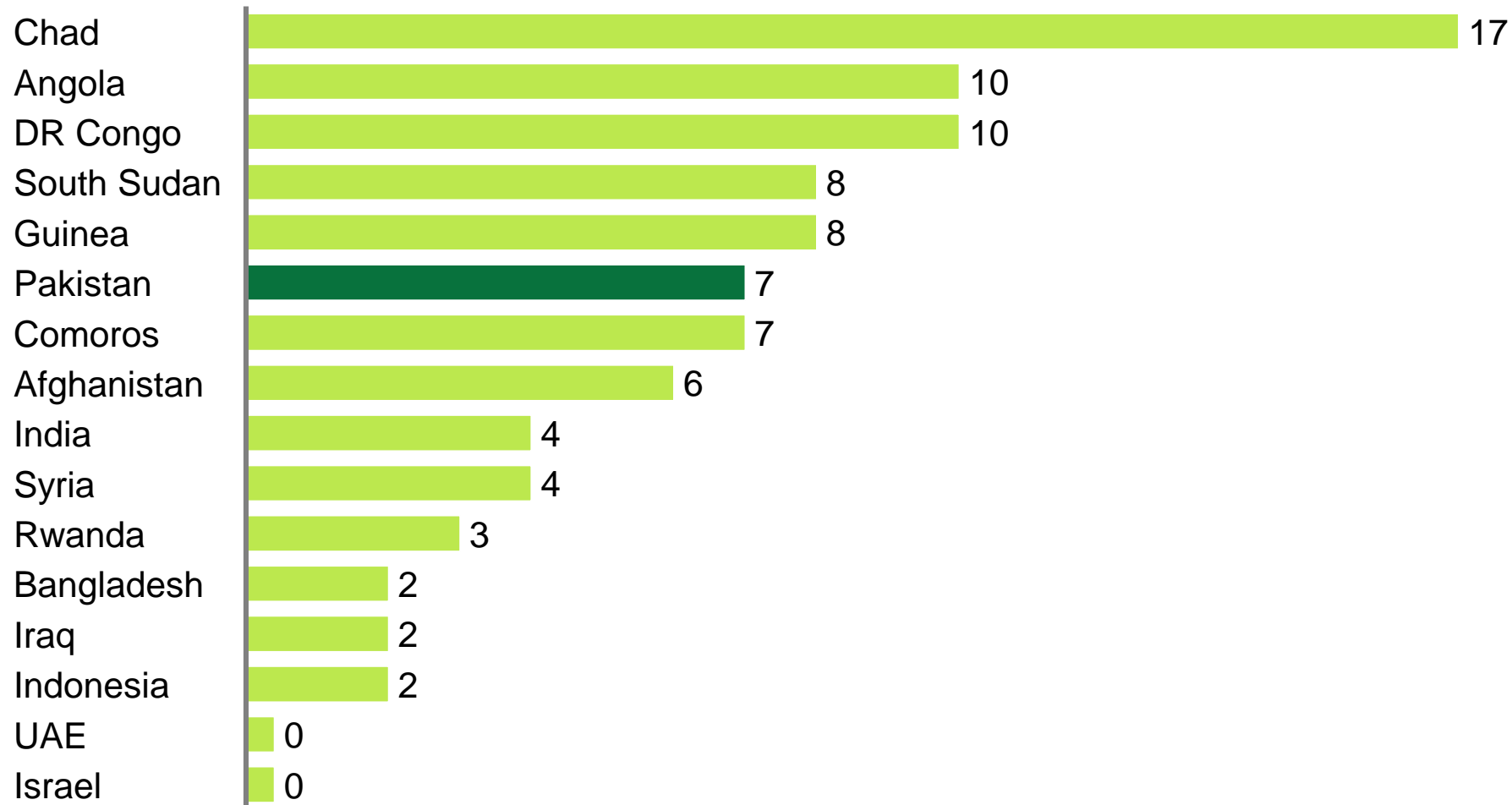




Pakistan's poor water quality leads to thousands of deaths per annum

Impact of water quality by country, 2016,

Deaths of due to diarrhea of children under age 5, per 1000 live births



- **30% of all diseases in Pakistan** are attributable to contaminated water
- **< 20% of** waste-water is properly treated
- Pakistan is **3rd worst in diarrhea deaths** around the world



Challenges in the water sector

Potential solutions



Some potential solutions to Pakistan's water issues are desalination, drip irrigation, water trading, and waste-water treatment

Challenges:

Shortage



Inefficiency



Quality



Potential solutions:

- **Desalination**

- **Drip irrigation**
- **Water trading**

- **Waste water treatment**

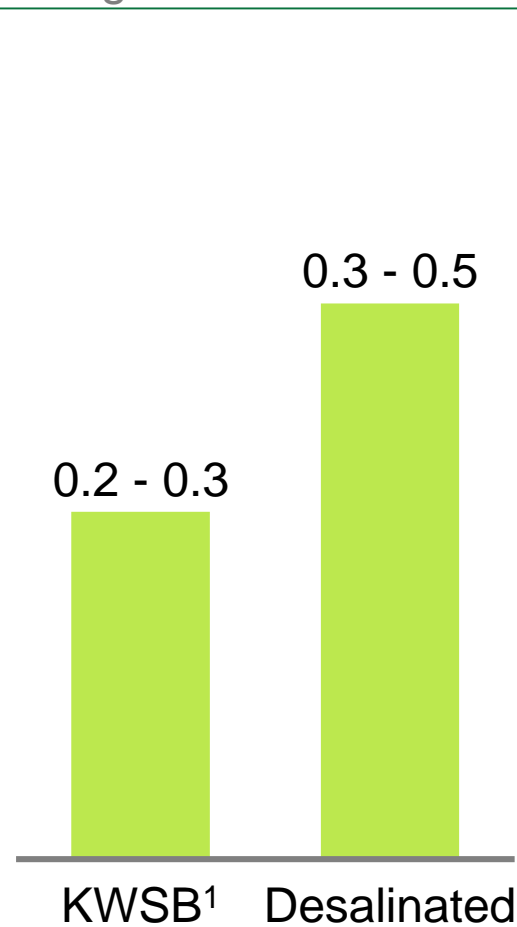


Providing desalinated water at scale will require government subsidy

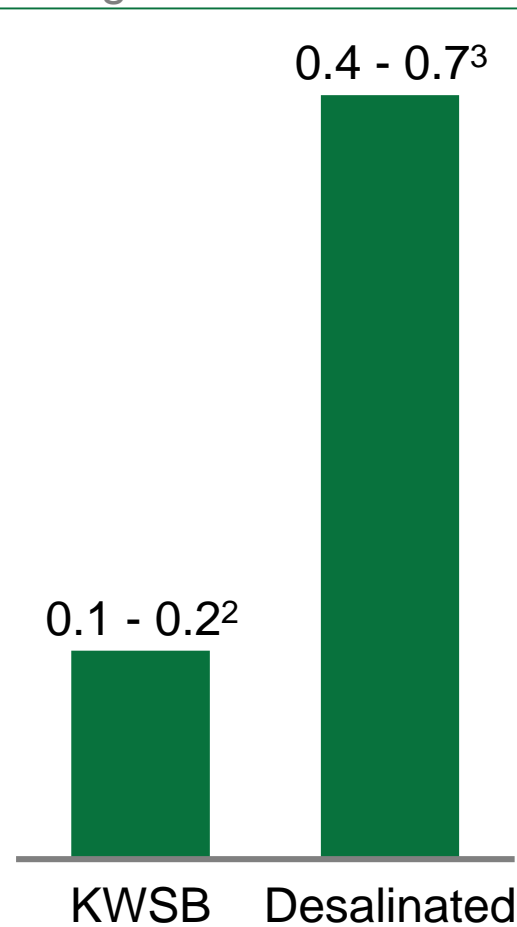
Project description

- Desalinating 100-120 millions of gallons per day
- Solves 25-30% of Karachi deficit
- CAPEX \$500m – 1bn

Cost excl. distribution, PKR/gallon



Consumer price, PKR/gallon



Conditions for success

- Annual **government subsidy** of **USD 70-150 Mn⁴**

¹ Weighted average cost of KWSB

³ Based on net margin of 20%-25% on cost

² Subsidized price for residential customers of KWSB

⁴ Calculated based on price differential between current KWSB tariff and desalinated water price

Source: Global Water Intelligence (GWI), expert input, World Bank, expert input, press search



With government intervention, drip irrigation could make water usage much more efficient

Project description

- Manufacture & installation of **drip line irrigation equipment**
- Potential market¹ **~USD 8-13 Bn**

Current challenges

- Low water tariff (**~USD 1.3 / acre / year**)
- Cost of installing drip line irrigation **~USD 700 - 1200/acre**
- **Yield gains 20 - 60%**²
- Payback period **8-10 years**



Conditions for success

- Government provides subsidies (**USD 4-8 Bn³**) to encourage adoption

¹ Based on 20% of cropped area in Pakistan installing drip line irrigation

² As per Punjab Government benchmarks

³ 60% subsidy on total CAPEX based on current subsidy scheme by Punjab Government to convert 20% of farms in Pakistan from flood irrigation to drip irrigation

Source: Pakistan Bureau of Statistics, Ministry of Finance – Pakistan, Expert input, State Bank of Pakistan



Water trading could improve Pakistan's water efficiency, as it did in Australia

Australia Case Example



Problem



- **Centralized control** of Australian water sector
- **Overallocation** of water to inefficient uses



Solution



- In 1994, Australian government established **water entitlements, prices, and trading**



Impact



- Trading provided **incentive to reallocate water to more productive uses**
- Water efficiency in agriculture improved by **2.5X**

¹ Agriculture water consumption 2000: 15,000 GL 2018 12,150 GL Agriculture output 2000: USD 30.2 Bn 2018: USD 60 Bn

² Value of water market is between USD 1 -- 2 Bn

Source: Australia Water Market Report, Australian Department of Agriculture, Press search
www.engro.com



Wastewater plants require subsidies and/or regulatory support to be feasible

Project description

- Wastewater treatment plant for municipal or industrial outflow
- Typical CAPEX of **USD 4-8 Mn / MGD**



Conditions for success

- Government subsidy or DFI support** to make opportunity economically feasible, at current municipal water prices



- Enforcement of existing regulations**

Case examples

China 🇨🇳

Government signed agreement with ADB² to develop waste-water treatment plant in Tianjin

India 🇮🇳

Arulpuram Common Effluent Treatment Plant was developed after **TNPCB³** passed a **regulation** for bleaching and dyeing units to enforce **Zero Liquid Discharge (ZLD)**

¹ Very high-level estimate. Includes net margins of 20%-25%.
Source: Press Search; ADB website, Athena Infonomics; press search
www.engro.com

² Asian Development Bank

³ Tamil Nadu Pollution Control Board



Summary: water issues are multi-faceted and cannot be resolved by the private sector without public sector support

Challenge

Potential solutions

Conditions for success

1. Scarcity

- Large scale desalination plants

- Cost of desalinated water higher than cost of KWSB water, necessitating government subsidy
- Donor funding would help to derisk capex

2. Inefficient use

- Drip irrigation
- Trading of agricultural water

- Drip irrigation economically infeasible for farmers given low cost of water; would require subsidy
- Water trading highly successful in Australia – requires government regulation

3. Poor quality

- Waste-water treatment plants

- Govt or donor-funded subsidy (for municipal waste)
- Enforcement of existing regulations (for industrial waste)