Priority #6: Water

Executive summary

22 August, 2010

Objectives of this priority

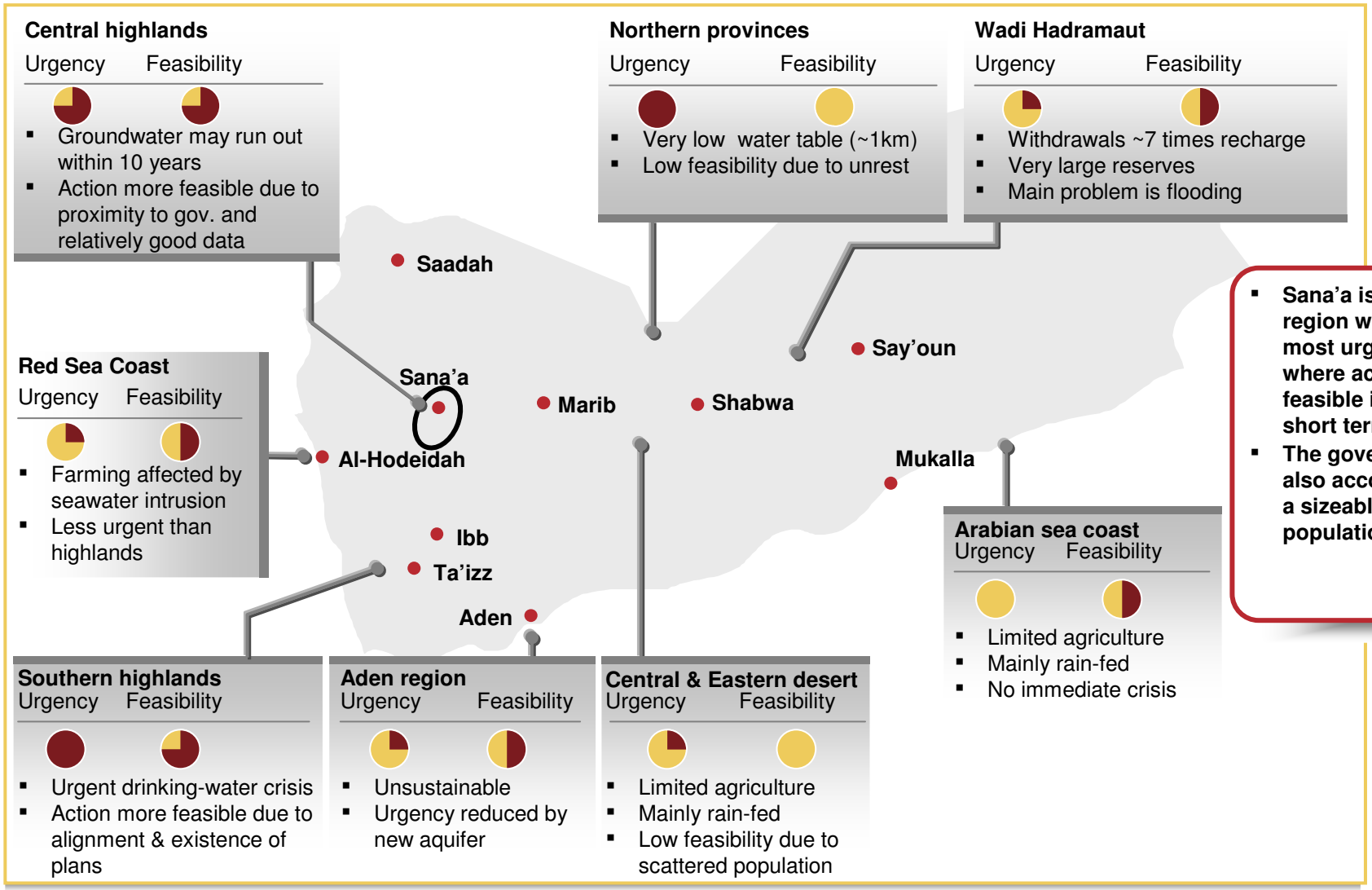
1. Illustrate the approach to resolving the water sector challenge in Yemen through the Sana'a basin example, including a sequenced action plan for the basin

2. Show the steps for all of Yemen to reach sustainability over time through an integrated strategy

3. Recommend organizational change required for success and allocate roles and responsibilities

Water crisis varies by region; Sana'a basin in particular requires urgent attention, & could be a compelling pilot for tackling Yemen's water situation

Key water challenges in Yemen, by region



SOURCE: NWRA, interviews with local experts

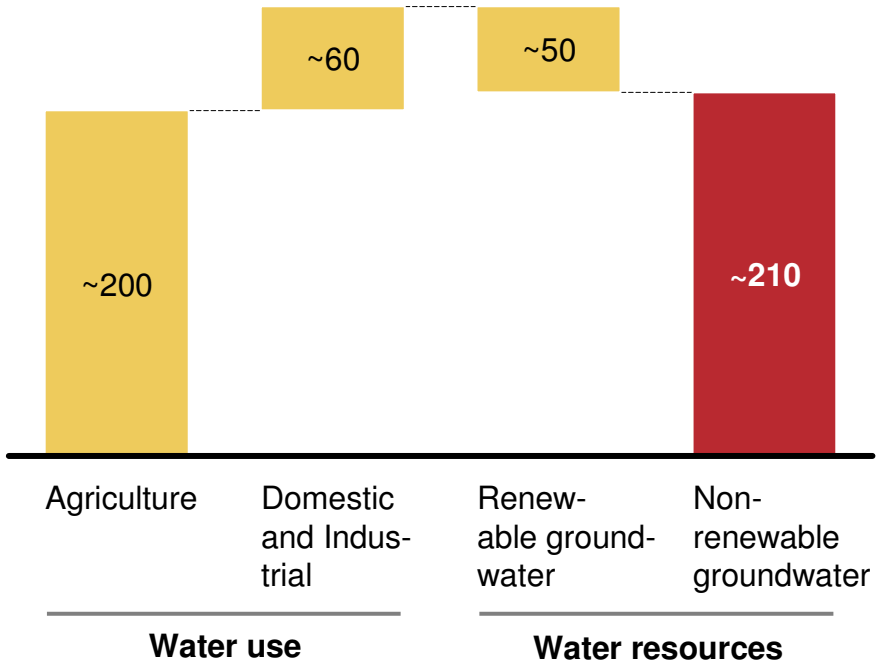
If the current trend continues, Sana'a basin will face severe water crisis & may even run out of ground water in the coming decades[D]

SUSTAINABILITY ESTIMATES
DIRECTIONAL

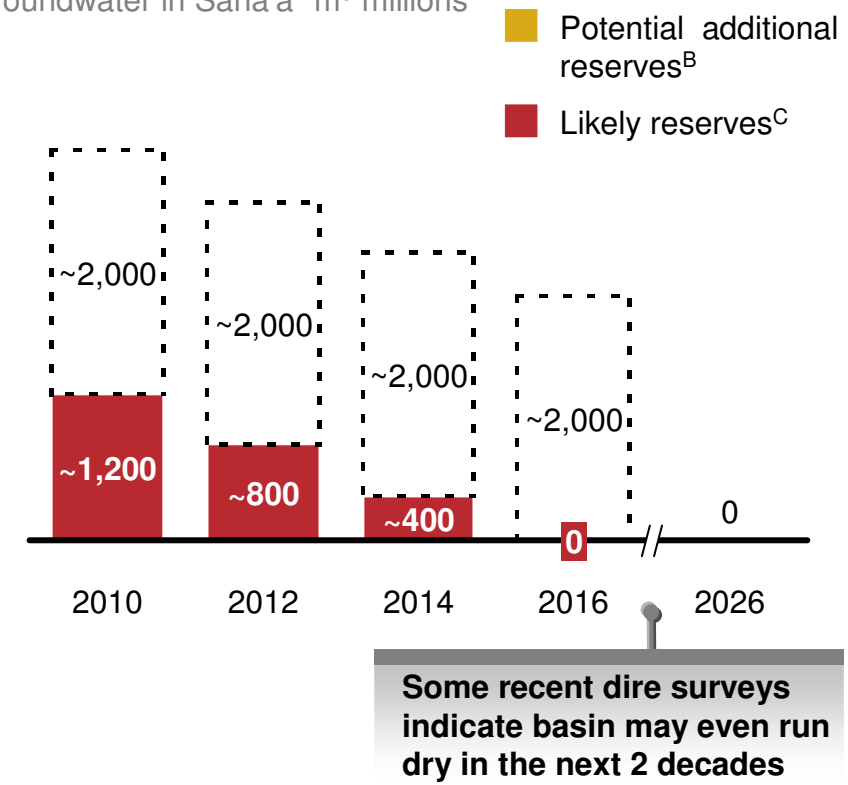
Currently, ~80% of Sana'a's water is supplied by non-renewable groundwater …

… but, according to recent dire surveys, this may run out as early as the next decade (estimates widely vary)

Groundwater use and resources in Sana'a, 2010
m^3 millions



Likely recoverable reserves of non-renewable groundwater in Sana'a[A] m^3 millions



A Assumes constant water gap of 210m m3
B NWRA Sana'a basin report (2006) quotes likely reserves in 2000 as 5220m m3
C NWRA economic incentives report quotes likely reserves in 2000 as 3220m m3
D Excluding the Ramlat As' Sabatayn aquifer which is yet to be explored and does not belong to the Sana'a basin

SOURCE: Team analysis, NWRA, MOAI

The path to water sustainability in Sana'a involves selecting a combination of measures, trading off cost, volume & enforceability

Policies and measures for a sustainable solution in the Sana'a basin

NOT EXHAUSTIVE | APPROXIMATE

	Measures and policies	Cost $/m^3	Vol. M m^{3A}	Enforceability
Reduce water use	▪ Migration of population in urban areas from highlands to coast	26.0	81	very difficult
	▪ Improvements in domestic and industrial distribution efficiencies	1.7	10	relatively easy
	▪ Phase out of ground water irrigated agriculture through removal of diesel subsidies, drill ban enforcement etc	1.0	200	very difficult
	▪ Improvements in irrigation efficiency	0.3	90	relatively easy
Increase available resources	▪ Desalination, as an ultimate option	4.0	∞	medium
	▪ Ramlat As' Sabatayn Aquifer, contingent upon official estimation & certification	2.4- 3.4	320,000	medium
	▪ Installation of rain water harvesting at individual household level	2.5	20	difficult
	▪ Recycling water, both for connected and unconnected households	2- 2.4	35	relatively easy
	▪ Use of renewable shallow wells only	0.1	51	easy

A The volume levels are 'up to'

SOURCE: Team analysis, NWRA, MOAI

In defining the 2020 end state for the Sana'a basin, GoY should avoid the extremes of insufficient or economically unsustainable water use

	Acute crisis due to collapse in resources	Balanced & sustainable solution for Sana'a basin	Economically un-sustainable water use
			
Key elements of 2020 end state	▪ Acute water crisis in Sana'a; public health issues and mass migration to coastal areas ▪ Groundwater fed agriculture collapses and rural population migrates in uncontrolled manner ▪ Conflicts over remaining water resources create additional tensions	▪ Focus on water conservation ▪ Agriculture entirely based on rain-fed model and on modern agricultural techniques; rural-urban migration controlled by government ▪ Urban population and industry rely on renewable water sources, eg rainwater harvesting, recycling, shallow wells etc	▪ Focus on increasing resources through desalination ▪ Economic activities and demography remains on current trajectory ▪ Ongoing subsidies required for use of desalinated water for large portion of population and parts of agriculture
Cost of end state to Yemen 2010-2020, cumulative USD b	~16[A]	~2 to 3[B]	~4[B] (ongoing subsidies required)

A Cost of new developments, lost income and military enforcement; assumes $15,000 per house, 5 people per house, $1,000 per cap infrastructure, $100 per cap transport, $1,000 per cap lost income; 1 soldier per 100 population to ensure orderly transfer, $500 cost of each soldier per month

B Assumes $4-$5 for desalination; based on expected price for Taiz, but with cost of pipeline doubled

SOURCE: Team analysis

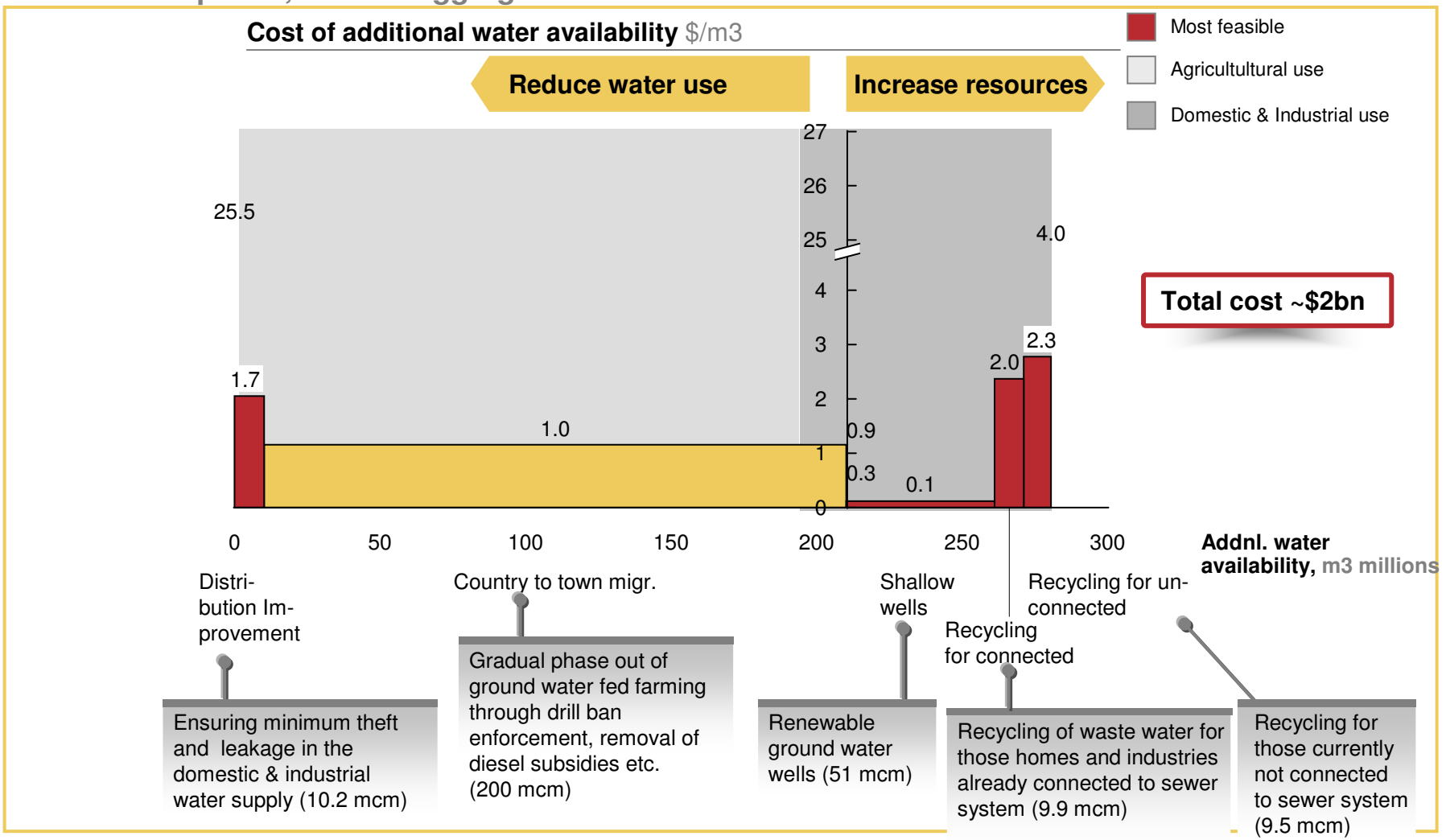
This chosen end state will depend primarily on Yemen's policy choices today (2010)

	Acute crisis due to collapse in resources	Balanced & sustainable solution for Sana'a basin	Economically un-sustainable water use
			
Key elements 2010 policy choices	▪ Policy makers choose path of "least resistance" by avoiding to make politically difficult decisions ▪ Government unable to enforce current conservation laws ▪ Diesel subsidies continue to sustain or accelerate agricultural groundwater use	▪ Removal of diesel subsidies and enforcement of drilling laws lead to gradual decline of ground-water fed agriculture ▪ Incentives for conservation measures (e.g., collection, recycling) increase effectiveness of entire water cycle	▪ Usage patterns including agriculture unchanged ▪ Government invests in provision of either massive desalination capacity or in treatment of water of remote aquifers
Implementation difficulty	▪ Low: preserves status quo	▪ High: Forces difficult decisions now	▪ Medium: Requires access to continuous financing to sustain

SOURCE: Team analysis

By 2020, GoY can sustainably manage the Sana'a basin without desalination or tapping new aquifers, if it can enforce phase out of groundwater irrigation

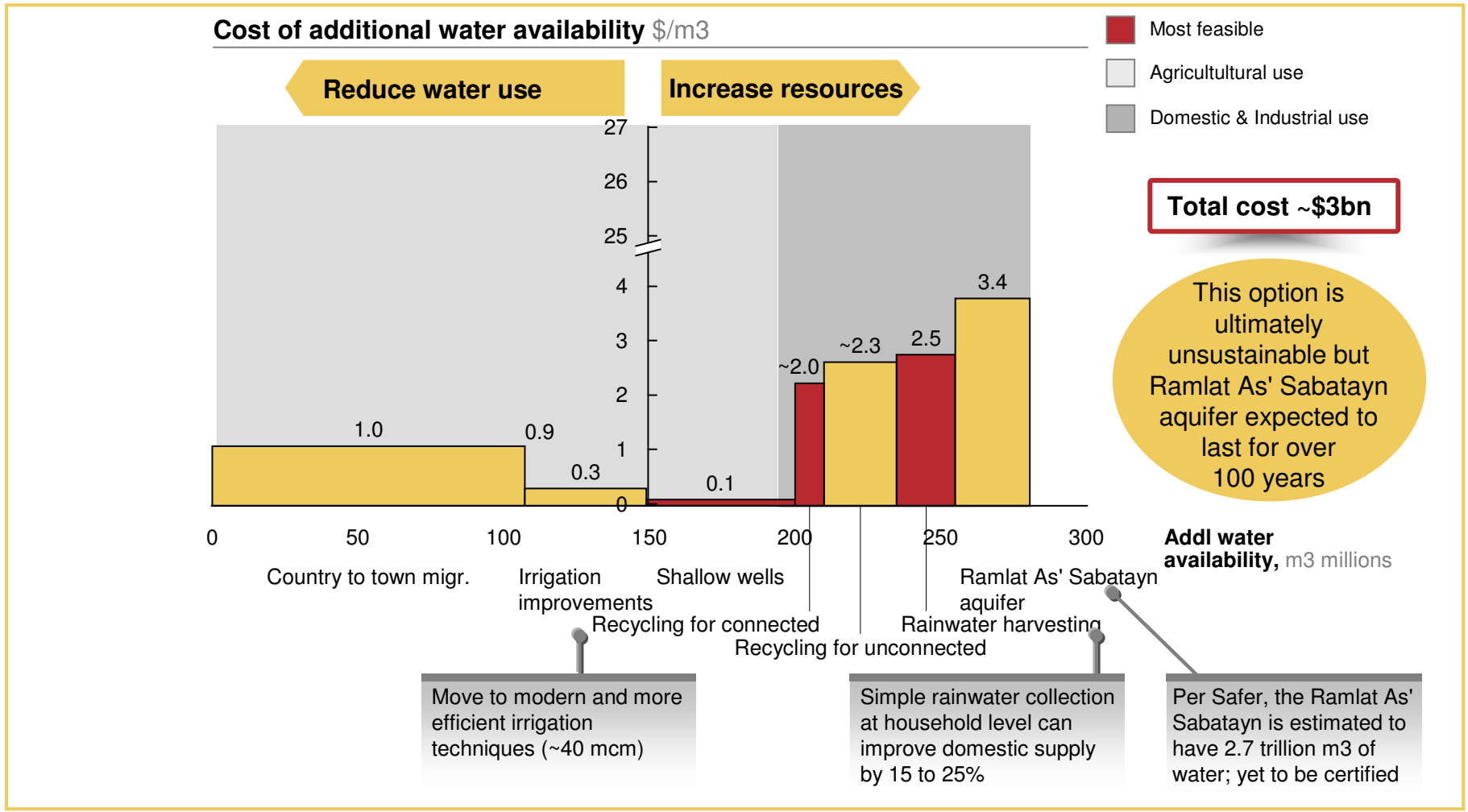
Sana'a basin – water availability cost curve which compares the impact and cost of levers pulled, to meet aggregate demand in 2020



SOURCE: NWRA, MoAI, team analysis, expert interviews

As a plan B, if irrigated agri. is limited to using only renewable groundwater, Sana'a can still hit sustainability through limited tapping of new aquifers

Sana'a basin – water availability cost curve which compares the impact and cost of levers pulled, to meet aggregate demand in 2020



1 Ramlat As' Sabatayn

SOURCE: NWRA, MoAI, team analysis, expert interviews

Sana'a is one focus area; To address the national crisis, GoY needs to act on urgent 'no-regret' moves & create a long term strategy

Key horizons in recovering water sustainability

	By end 2010	By end 2011	By 2020
National strategy	▪ National **alignment campaign** launched by President to ensure scale of the crisis is fully understood ▪ Sana'a and Taiz/Ibb – **fact base secured** (all data necessary for clear strategy) ▪ Sana'a & Taiz Basin Committees equipped with "**water-crisis barometers**"	▪ Sana'a and Taiz/Ibb – integrated strategies in place and **implementation** begun ▪ Other basins **fact base** gathered ▪ Continued **alignment** work underway; All Basin Committees equipped with "**water-crisis barometers**" ▪ **Ramlat As' Sabatayn aquifer certified**	▪ Integrated country-level **strategy** in place ▪ Sana'a and Taiz/Ibb – strategy fully implemented and **sustainability restored** ▪ Other basins – implementation underway and measurable **impact** achieved
No-regret moves	▪ **Ramlat As' Sabatayn aquifer** feasibility understood ▪ Work begun to rehabilitate Sana'a **wastewater** plant ▪ **Willingness to pay** for water determined in Taiz & Ibb, based on which decision made on scale of **desalination** plant in Mokha ▪ Enforcement of Decree 141 begun, to **control drilling** ▪ **Gradual increase** of diesel prices ▪ Pilot to **buy water** from farmers launched	▪ Sana'a wastewater plant rehabilitation **complete** ▪ Regulation of **trucked water,** starting with Taiz pilot ▪ Taiz desalination plant **complete by 2013,** if feasible ▪ Drilling activities **fully controlled** by the government ▪ **Further increases** in diesel prices ▪ **Buying water** from farmers spread across all critical basins ▪ Law enforcing **rainwater harvesting** passed	▪ Sana'a wastewater plant **expanded**, supplying ~25% of current water gap ▪ Rainwater harvesting **law enforced** in critical basins

SOURCE: Team analysis

In particular, due to the interconnected nature of the challenges, Yemen urgently needs an integrated strategy to effectively manage its water crisis

Key economic elements of integrated water strategy

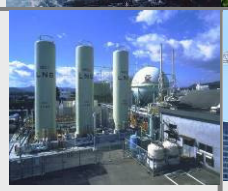
- **Widespread recognition of the scale of Yemen's water crisis**
- **Accurate information on water scarcity and cost of potential solutions, financial and social**

Water infrastructure strategy

- Dam construction
- Desalination plants
- Waste water plants
- Water pipelines
- Distribution upgrades

Agricultural strategy

- How much agricultural land can be kept?
- How can this be enforced?
  - Which crops?
  - How can irrigation be improved?
    - Incentives to farmers
    - Technology and capabilities



Energy strategy

- How will fuel be sourced for desalination and wastewater treatment?
  - Yemeni natural gas?
  - Imports of coal or heavy fuel?

Urban development strategy

- How will people be relocated?
  - Location
  - Infrastructure
  - Job opportunities
  - Enforcement

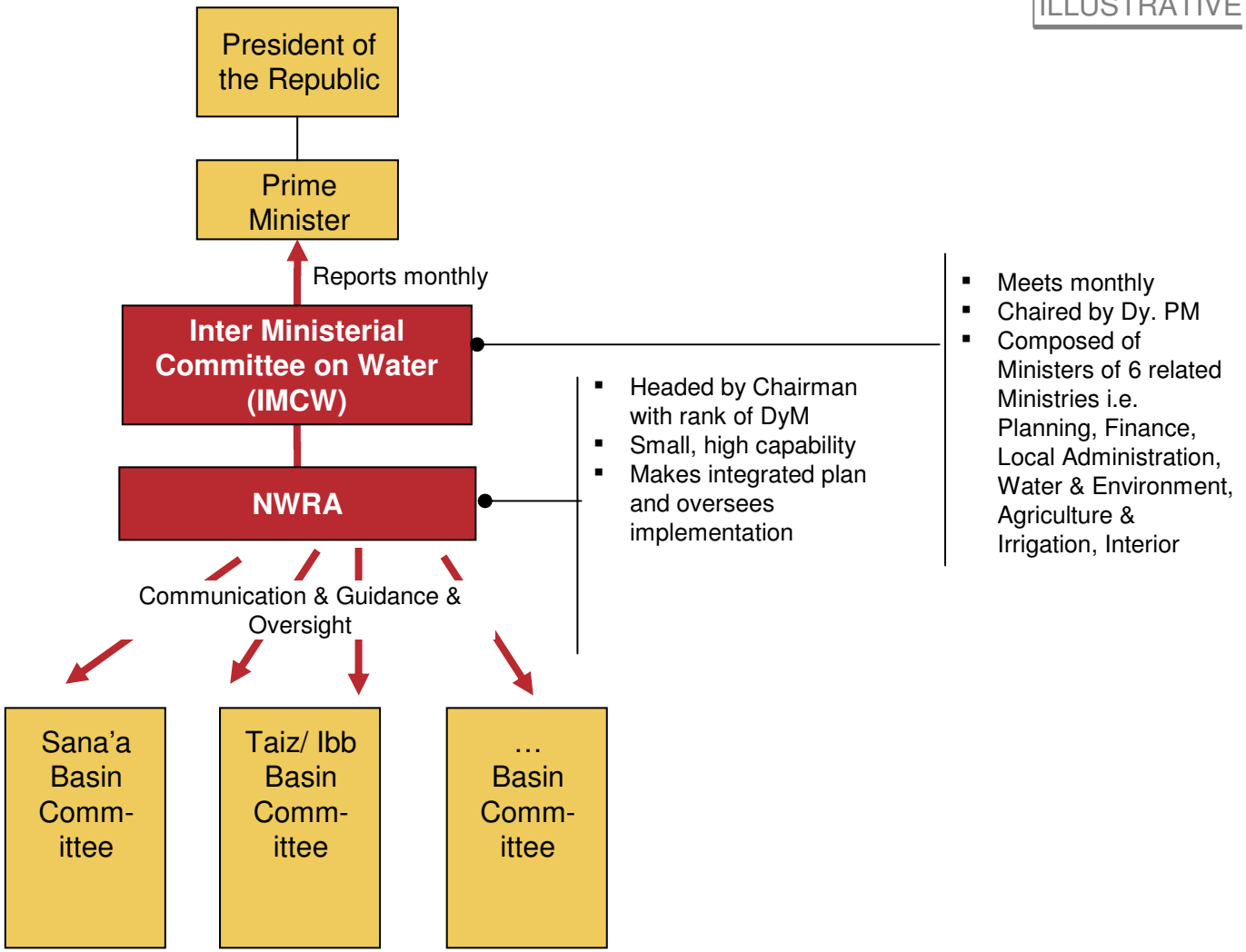
SOURCE: Team analysis

In order to kick start the journey toward water sustainability in Yemen, the Prime Minister should make immediate and urgent first decisions

- Formal request for a Presidential declaration of a **"National state of emergency"** over water (Sept 2010), and **announcement for a national water conference** (Oct 2010)
- Formal request to the President to issue a **Republican decree formalizing the Inter- Ministerial Committee on Water** in its current structure with expanded mandate
- **Commission a comprehensive basin water strategy study** starting with data gathering in Sana'a and Taiz/ Ibb
- Immediate **action on** necessary **near-term projects**
  - Study of **potential of Ramlat As' Sabatayn** aquifer conducted according to existing TOR
  - **Enforcement of drilling law** (e.g. special force created to collect and impound all unlicensed drills in the country)
  - **Commissioning** of a study and a tender for **expanding** the existing **wastewater plant in Sana'a**
  - Creation of a pilot **in Taiz** for **regulating supply of trucked water** (e.g., health, prices, potential direct subsidies to poor)
  - Commission **willingness to pay study in Taiz/ Ibb**, to decide whether/when to build **desalination plant in Mokha**
  - **Commission pilots in Taiz & Sana'a** for the Ministry of Water **to buy well water from farmers**

Water resource management, specifically, is an urgent issue in Yemen and requires active stakeholder coordination through a formal Inter Ministerial Committee on Water (IMCW) that directly reports to the highest powers

ILLUSTRATIVE



SOURCE: Team analysis

Achieving water sustainability will require the cooperation of several government organizations

PRELIMINARY

Sustainable Water Resource Management

Phases	Key decisions	Role of different agencies/organizations/entities: Prime Minister's Office	Ministry of Water and Environment	Ministry of Agriculture	IMCW	Ministry of Interior
Build basin-level fact base			▪ Tender RFPs and negotiate contracts ▪ Consolidate reports into a national, basin-by-basin fact base	▪ Support MWE/ consultants in gathering data on agricultural use of water by basin		
Formalization of IMCW	▪ IMCW governance and leadership	▪ Create legal mandate for IMCW with participation from six ministries	▪ Transfer NWRA under IMCW as technical secretariat	▪ Transfer knowledge base and any technical secretariat to IMCW	▪ Recruit personnel and launch regular activities	
Launch of national strategy	▪ Strategy for "social engineering"				▪ Develop and syndicate national strategy ▪ RFP and negotiate social engineering contract	▪ Enforce drilling ban
Infrastructure investments (desalination, treatment, and aquifer)	▪ Prioritization of major infrastructure projects				▪ Tender RFPs and negotiate contracts for infrastructure projects	

SOURCE: Team analysis

BACKUP

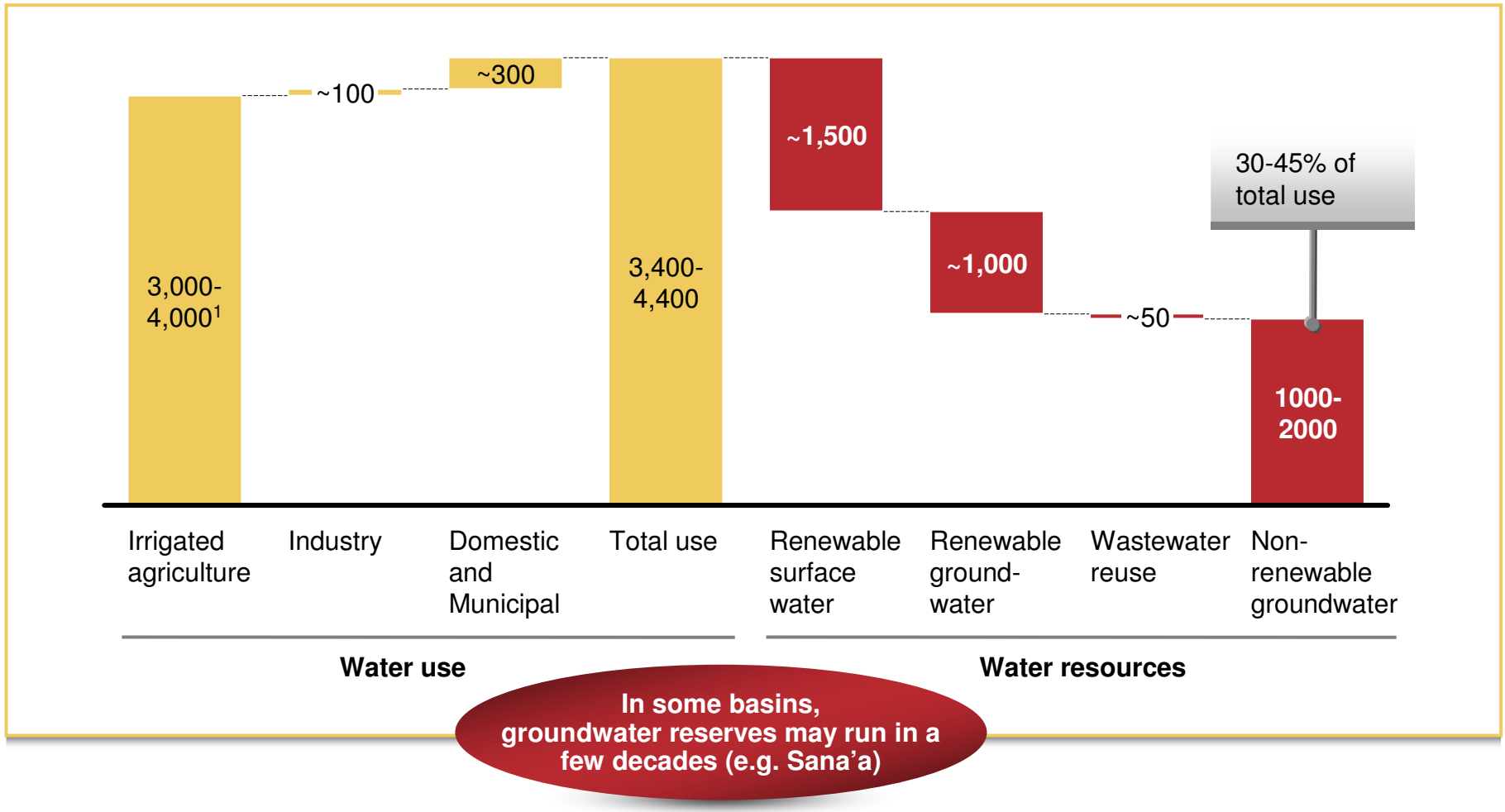
Contents

- **Long-term scenarios for Sana'a and Taiz basins**
- Additional backup on roadmap for implementation
- Mechanism for implementation

Yemen's water use is not sustainable; while estimates of usage vary, all previous studies indicate heavy reliance on non-renewable water resources

2008 water volume (**estimate** which **is crudely indicative and needs to be updated** based on new comprehensive studies), MCM/year

ESTIMATES ONLY
DIRECTIONAL



1 Estimates vary widely depending on the source: JIKA (1997) reports ~3,000 agricultural usage; Recdecker (2007) reports ~4,000, but this does not count recharge from pumped water, according to NWRA incentives study

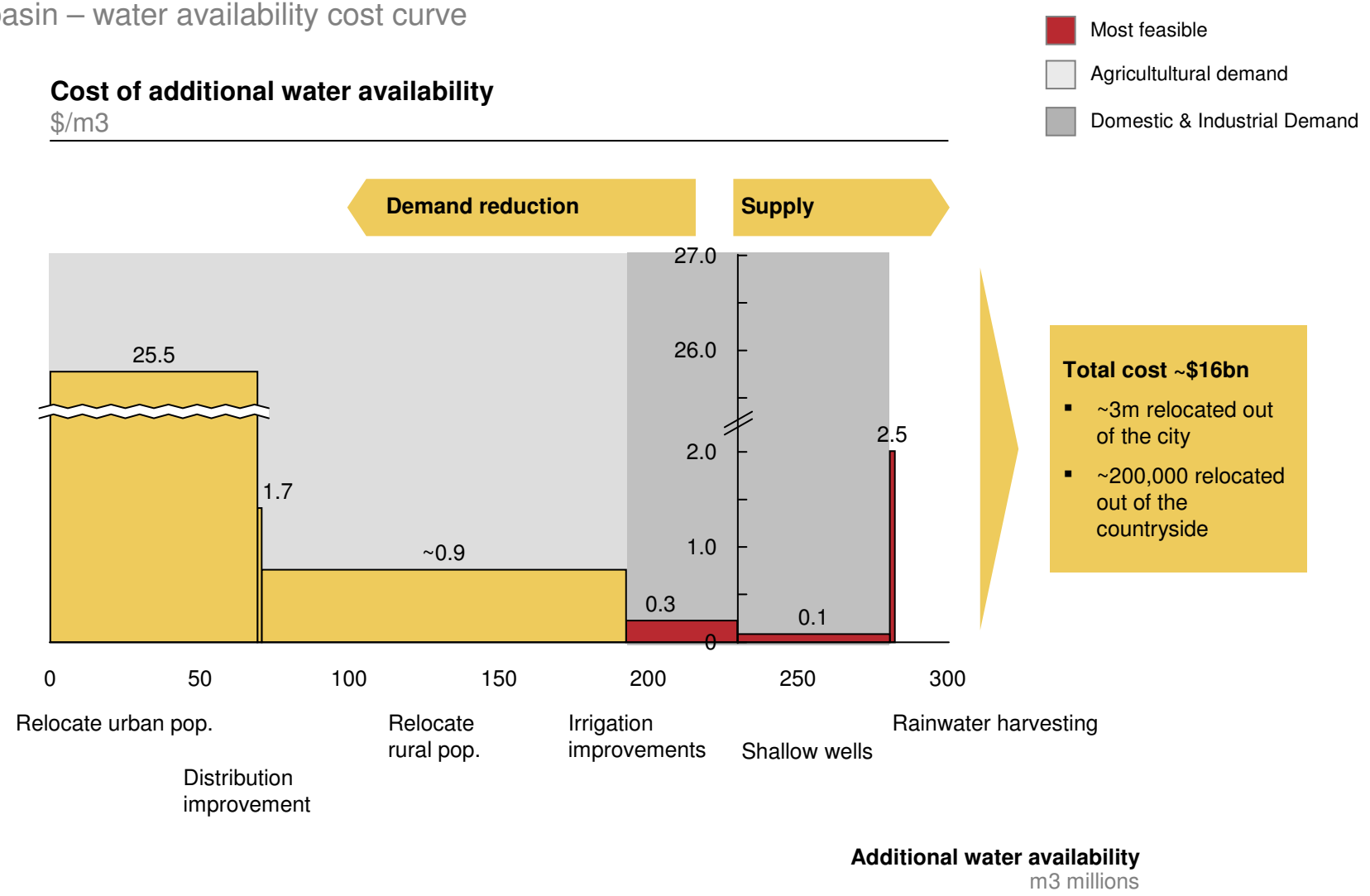
SOURCE: National Integrated Water Resource Management Program; Interviews; NWRA incentives study; Team analysis

Assumptions for volume and cost of additional water supply for Sana'a

	Cost ($/m^3)	Volume p.a. (m m^3)	Rationale	Source
Shallow wells	0.1	51	▪ 0.11 liters of diesel per m3 ▪ 51 m m^3 renewable water	▪ MoAI water savings report ▪ Sana'a basin action plan
Irrigation improvements	0.3	90	▪ 90 m m^3 total saving would require – $10m tecnology cost amortized over 10 years – $3m public relations – $12m armed force (1 soldier per 5 wells)	▪ Sana'a basin action plan – World Bank Sana'a basin project – Team analysis – Team analysis
Relocate rural population	1	200	▪ Saving per person is ~660 (average consumption) ▪ Cost of moving includes new home, infrastructure, travel, 1 year income, and 1 soldier/year per 100 people	▪ NWSSIP ▪ Team analysis ▪ MoAI ▪ Team analysis
Distribution improvements	1.7	20% of domestic & industrial	▪ $168 average per new connection ▪ 24m^3 consumption per person ▪ 20% potential saving ▪ 20 year amortization	▪ NWSSIP ▪ Team analysis ▪ MoAI ▪ Team analysis
Recycling	2 if connected 2.4 if not connected	70% of domestic & industrial	▪ $2 is high end of market range ▪ $0.4 is connection cost ▪ 70% is maximum that can be saved	▪ McKinsey research ▪ NWSSIP ▪ Conservative estimate of McKsiney expert
Rainwater harvesting	2.5	25% of domestic and industrial	▪ $1500 per household of 10 people amortized over 10 years at 24m^3 annual consumption each	▪ MoAI, team analysis
Marib aquifer	3.4	320,000	▪ 1996 cost was estimated at $2.41 ▪ Cumulative inflation since then is 41%	▪ Sana'a basin action plan ▪ Team analysis
Desalination	4	Infinite	▪ Mokha – Taiz cost is $2.5 - $3 ▪ Sana'a pipeline costs are doubled ▪ (Note: WETS has quoted far lower price of ~$1.5-$2)	▪ Hail Said Group, team analysis ▪ Team analysis
Relocate Urban population	26	81	▪ Saving per person is 24 (average consumption) ▪ Cost of moving includes new home, infrastructure, travel, 1 year income, and 1 soldier/year per 100 people	▪ Sana'a basin action plan ▪ Team analysis

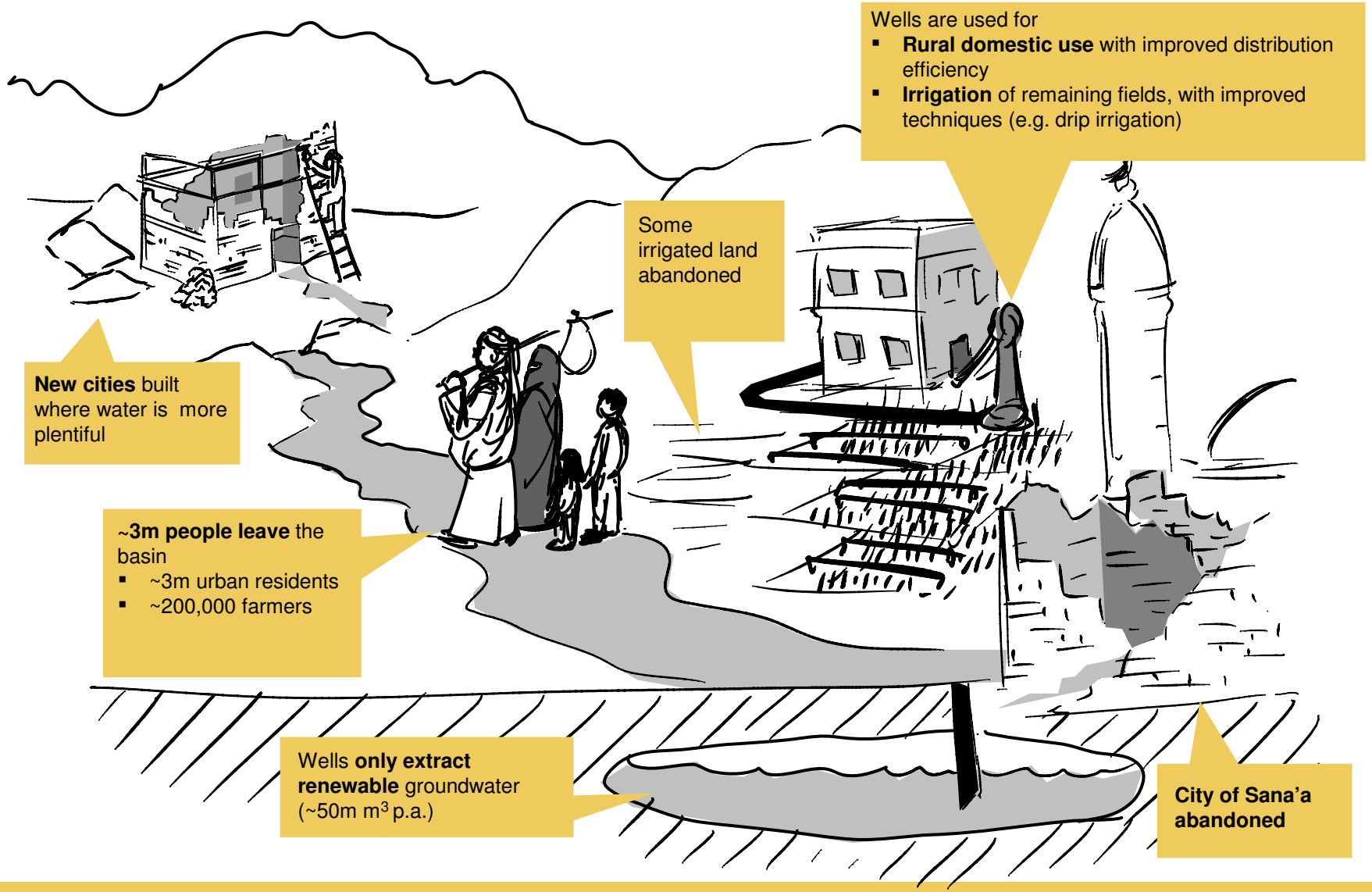
1 If agriculture continues to monopolise groundwater, most water for Sana'a's 2020 population will be sourced by relocating ~3m people (1/2)

Sana'a basin – water availability cost curve



SOURCE: NWRA, MoAI, team analysis, McKinsey expert research

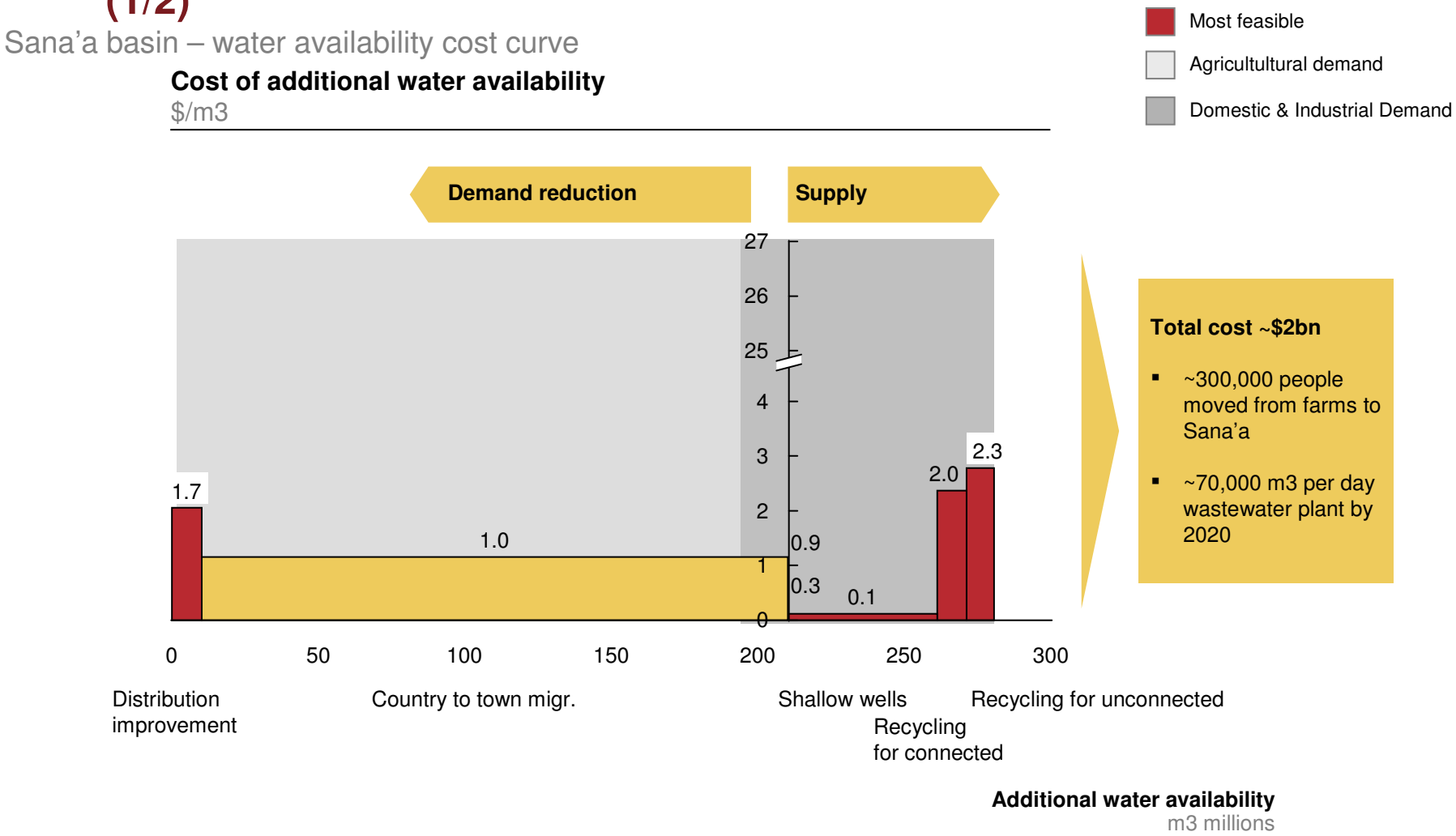
1 If agriculture continues to monopolise groundwater, most water for Sana'a's 2020 population will be sourced by relocating ~3m people (2/2)



SOURCE: NWRA, MoAI, team analysis, McKinsey expert research

2 If ground water irrigated agri. were removed and water efficiency improved, the entire population could be served without desalination (1/2)

Sana'a basin – water availability cost curve



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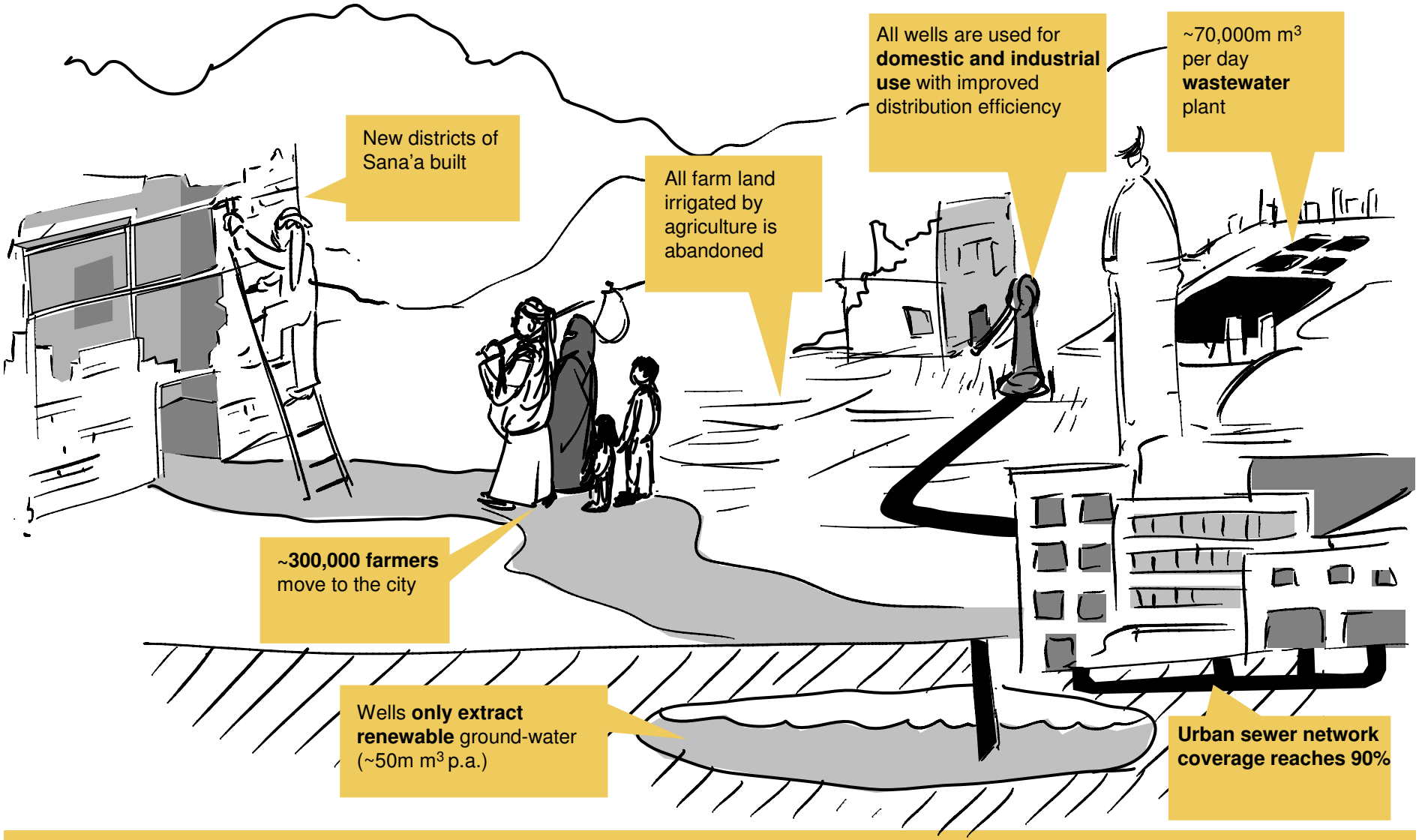
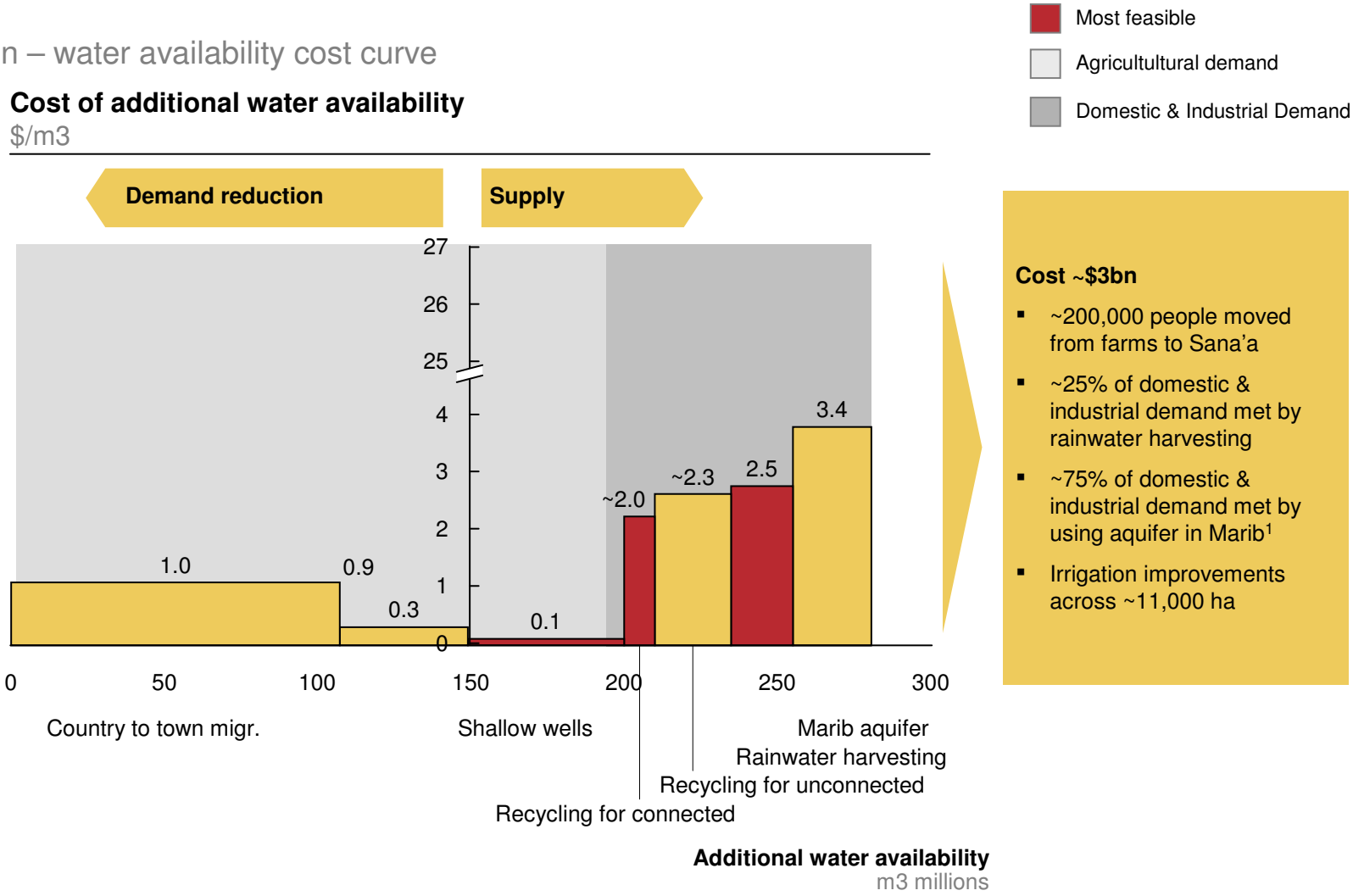


SOURCE: NWRA, MoAI, team analysis, McKinsey expert research

3 If agriculture used all renewable groundwater, ~200,000 farmers would be relocated to the city and the aquifer in Marib would have to be tapped (1/2)

Sana'a basin – water availability cost curve



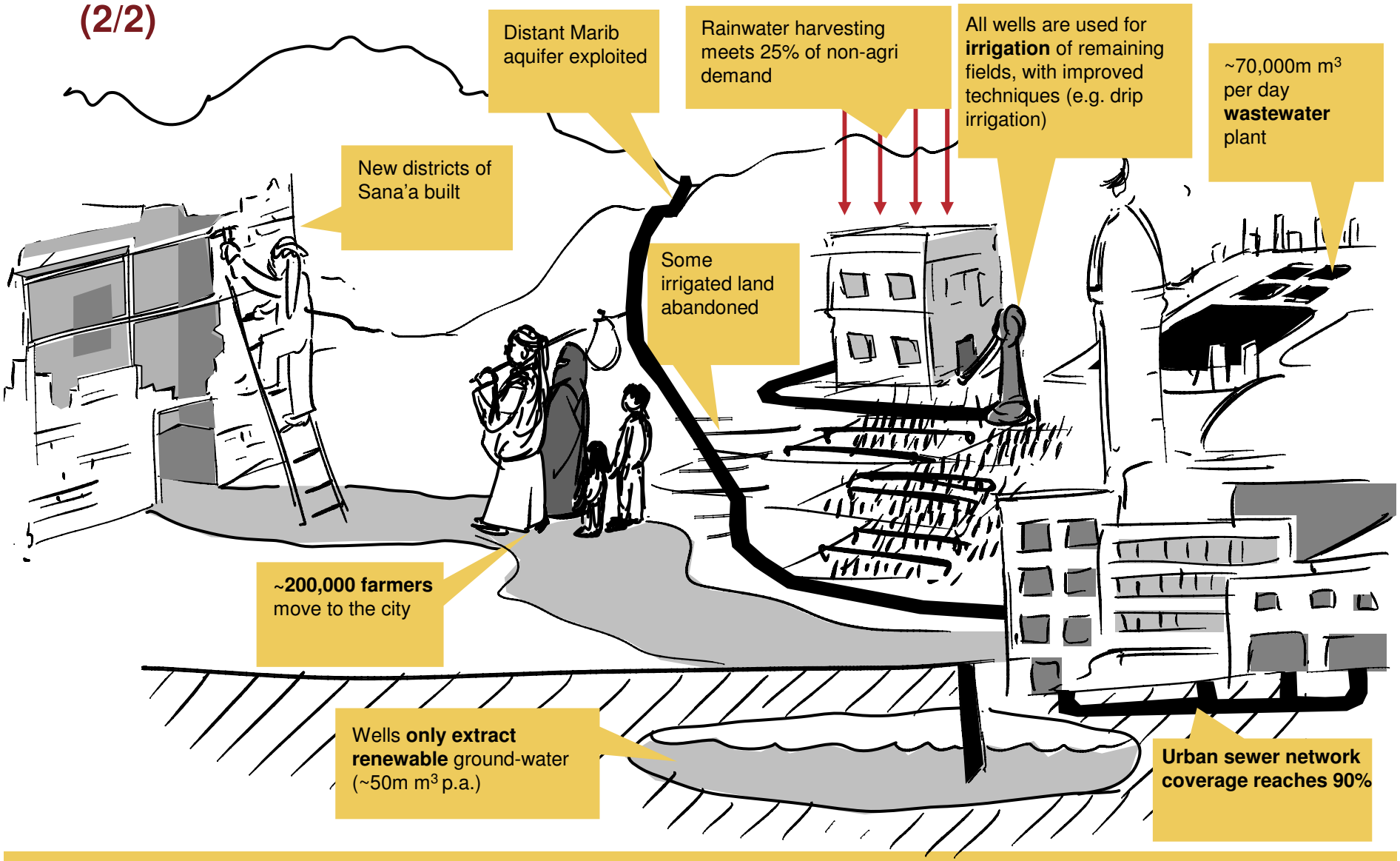
Cost ~$3bn

- ~200,000 people moved from farms to Sana'a
- ~25% of domestic & industrial demand met by rainwater harvesting
- ~75% of domestic & industrial demand met by using aquifer in Marib[1]
- Irrigation improvements across ~11,000 ha

1 Ramlat al-Sab'ateen

SOURCE: NWRA, MoAI, team analysis, McKinsey expert research

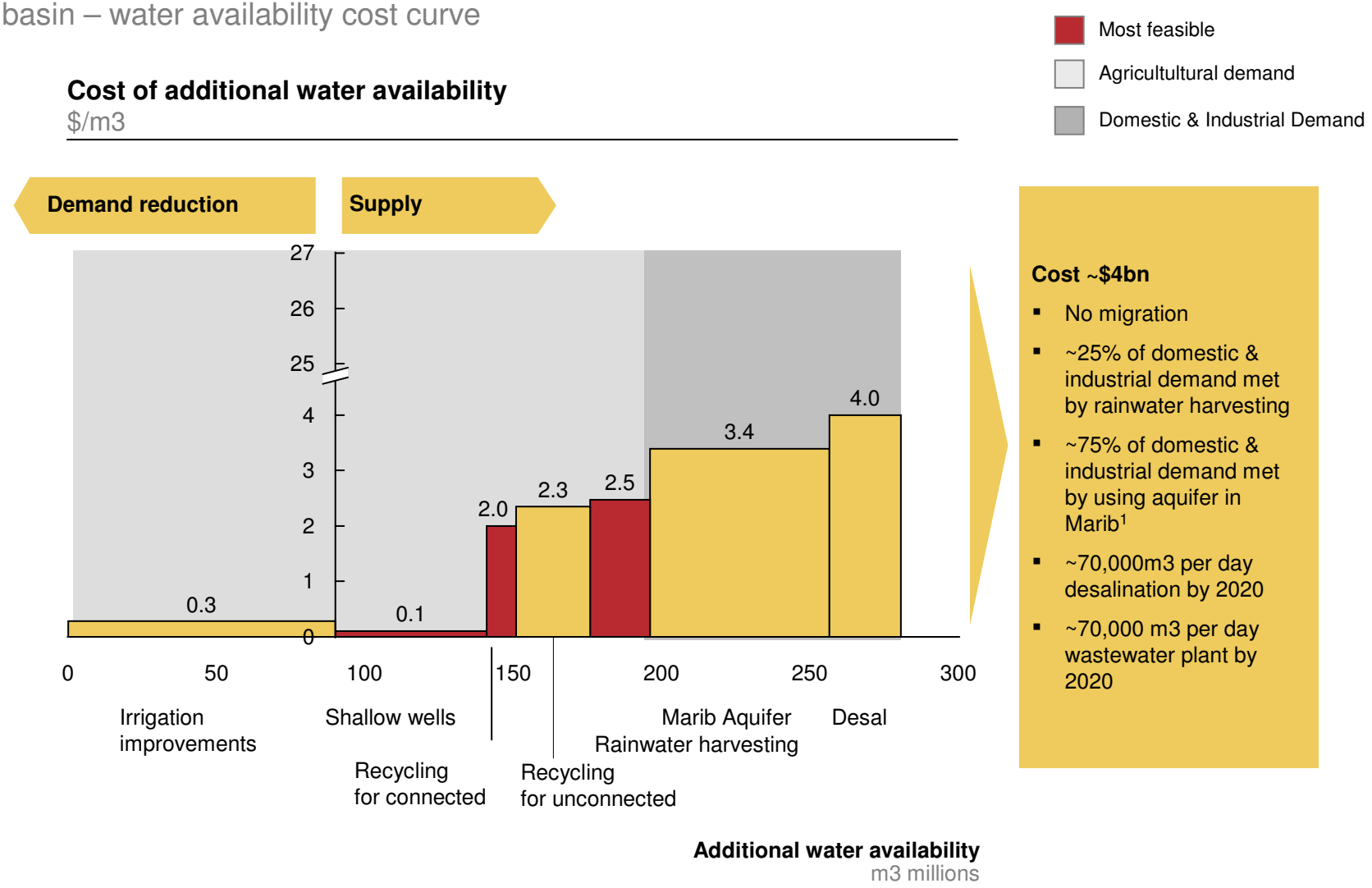
3 If agriculture used all renewable groundwater, ~200,000 farmers would be relocated to the city and the aquifer in Marib would have to be tapped (2/2)



SOURCE: NWRA, MoAI, team analysis, McKinsey expert research

4 All water demand could be satisfied with 70,000m3 per day desal, use of Marib aquifer and other costly measures to increase supply (1/2)

Sana'a basin – water availability cost curve

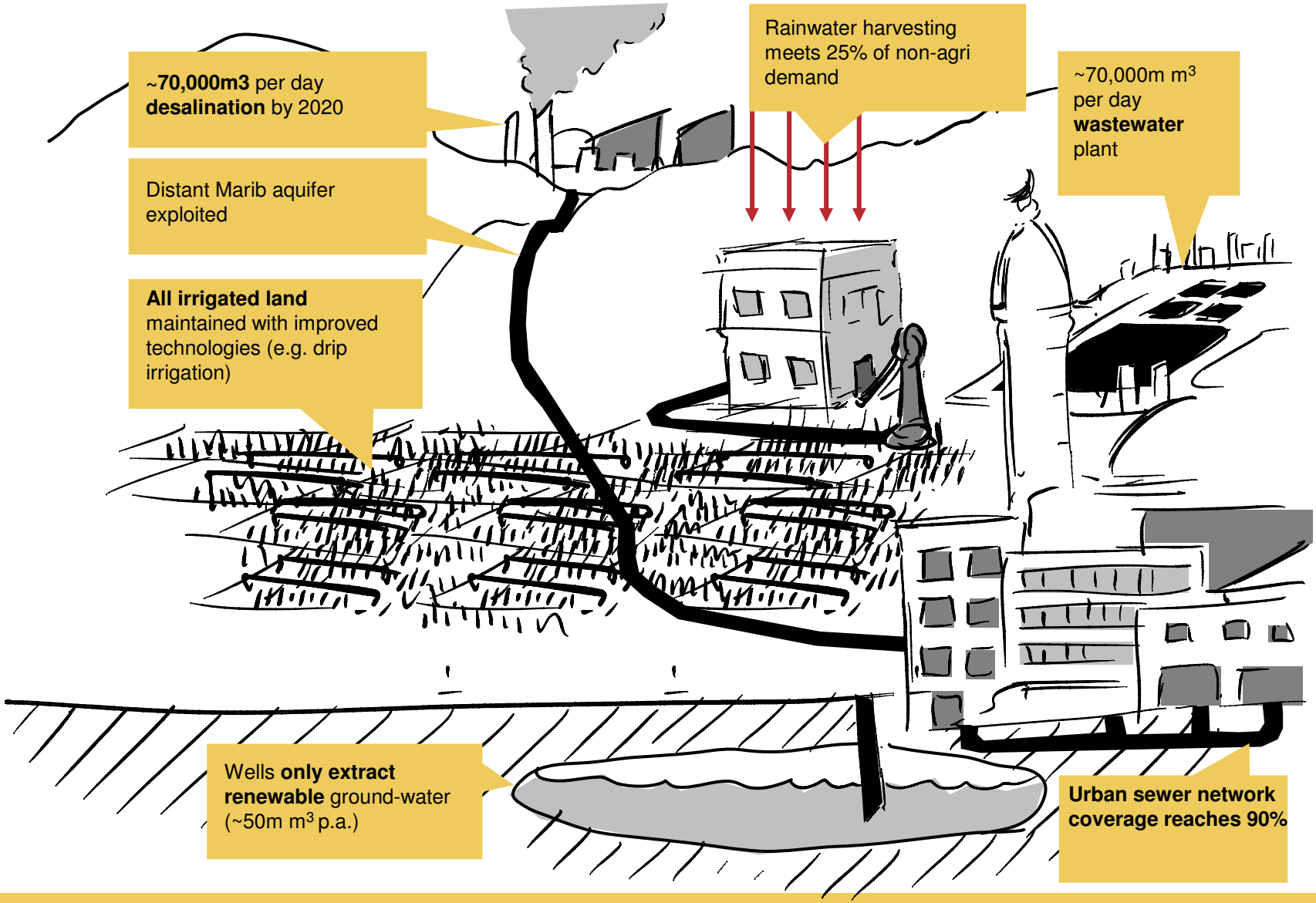


Cost ~$4bn

- No migration
- ~25% of domestic & industrial demand met by rainwater harvesting
- ~75% of domestic & industrial demand met by using aquifer in Marib[1]
- ~70,000m3 per day desalination by 2020
- ~70,000 m3 per day wastewater plant by 2020

SOURCE: NWRA, MoAI, team analysis, McKinsey expert research

4 All water demand could be satisfied with 70,000m3 per day desal, use of Marib aquifer and other costly measures to increase supply (2/2)



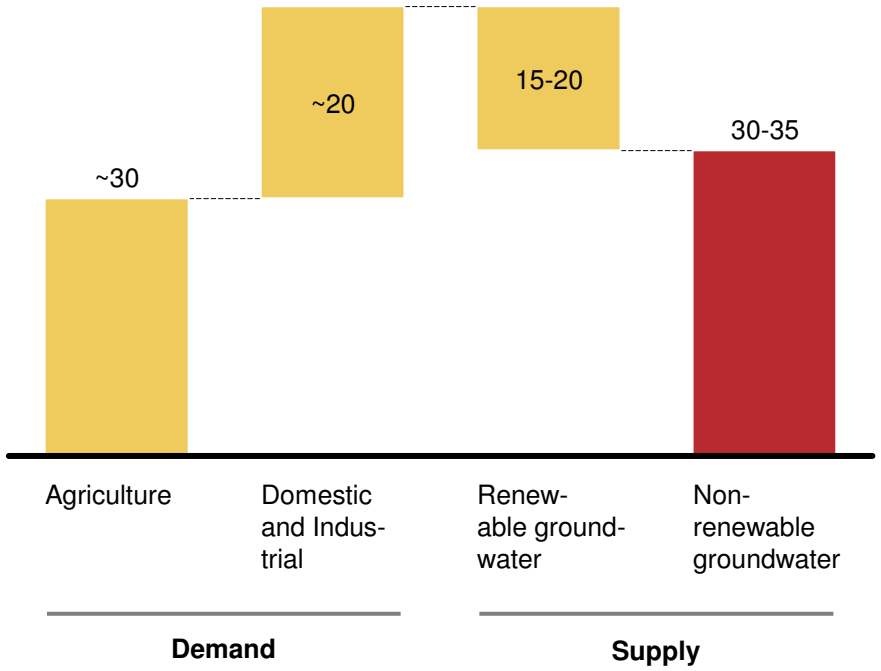
SOURCE: NWRA, MoAI, team analysis, McKinsey expert research

In Taiz, while the lifetime of aquifers is unknown, water is rapidly depleting with potentially severe consequences on security, health and education

EXAMPLE OF TAIZ

Currently, about 2/3 of Taiz's water is supplied by non-renewable groundwater…

Supply and demand of water in Taiz, 2010
m^3 millions



…leading to rapid depletion with consequences on security, health and education

Security
- At least 2 people have been killed in the last month in disputes over diminishing water resources

Health
- Insufficient water for sanitation and low quality drinking water have led to increasing cases of diseases (e.g. cholera)

Education
- Girls are spending less time in school due to walking increasing distances for water

No data exists for agricultural usage or current water gap in Ibb but it is assumed by NWRA to have unsustainable water usage

A Assumes constant water gap of 210m m3
B NWRA Sana'a basin report (2006) quotes likely reserves in 2000 as 5220m m3
C NWRA economic incentives report quotes likely reserves in 2000 as 3220m m3
D Excluding the Marib aquifer which is yet to be explored, estimated and officially certified, and in any case does not belong to the Sana'a basin

SOURCE: Team analysis, NWRA, MOAI

GoY can similarly choose from a range of options for Taiz's water end-state, depending on the levers it pulls today; key is to avoid extreme end states

	Collapse in the supply side	Balanced & sustainable solution for Taiz basin	Economically un-sustainable supply side
			
Key elements of end state	▪ **Uncontrolled demand**; Non renewable **groundwater used up** completely ▪ **Little or no** sustainable **supply side** sources ▪ Gradual **rationalization of** governorate **population due to severe water crisis**	▪ **Improved efficiencies on** the **demand** side – Improved irrigation – Greater recycling – Enforcement of drill- ban – Little or no groundwater irrigated agriculture ▪ **Economical supply** side – Rainwater harvesting to capture heavy rainfall – Distribution efficiencies	▪ **Uncontrolled demand** ▪ GoY decides to **sustain entire** agri./ domestic/ industrial **demand** through **expensive** supply side **options like desal** ▪ Socially non- disruptive but **fiscally unsustainable solution** in place
Cost of end state to Yemen USD b	~ 4 to 5[A]	~0.5-1	~3[B]

A Cost of new city, lost income and military enforcement; assumes $15,000 per house, 5 people per house, $1,000 per cap infrastructure, $100 per cap transport, $1,000 per cap lost income; 1 soldier per 100 population to ensure orderly transfer, $500 cost of each soldier per month

B Assumes $2-$3 for desalination; based on expected price for Taiz

SOURCE: Team analysis

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- Long-term scenarios for Sana'a and Taiz basins
- **Additional backup on roadmap for implementation**
- Mechanism for implementation

Immediate action is required in 2010 to put in place the long term solution

	Actions required in 2010	Outcome 2010
Create alignment	▪ Run wide-scale **public relations campaign** explaining why current population size and agricultural practices are not sustainable ▪ **Advertise benefits** of mitigating solution, e.g. – New infrastructure/jobs in coastal city – Clean, easily available desal water – Better returns from improved irrigation	▪ **Water is "the" topic in conversations with donors, public, etc** ▪ **Increasing acceptance of population that change is necessary** ▪ **Public awareness of government's role in mitigating consequences of crisis**
Create fact base	▪ For the **most water-stressed** areas, carry out rapid, comprehensive study of – **Groundwater** resources – Current **usage** pattern – Cost and impact of potential **solutions** (e.g. desalination, wastewater management, dams)	▪ **Increased understanding of how long water resources will last** ▪ **Full fact base from which to create an integrated water strategy**

SOURCE: Team analysis

Whichever option is taken, expanding and rehabilitating the Sana'a wastewater treatment plant is a no-regret move

Wastewater treatment in Sana'a

Current wastewater treatment plant is not functional

- Design capacity is 50,000
- Poor maintenance means water is not useable
- Large areas downstream are becoming polluted

3 actions are needed

- **Rehabilitate** current facility
  - Annual saving ~16m m^3
  - Capital cost ~$20m[A]
  - O&M <$30m p.a.[B]
  - Completion currently planned for 2015[C]
- **Expand to** new facility
  - Annual saving ~30m m^3
  - Cost <$60m p.a.[B]
  - Completion currently planned for 2020[C]
- **Manage** water use
  - Create plan for distribution of treated waste water
  - Raise awareness of farmers about use for irrigation

Total impact

- **~50m m^3 (25% of current gap)**

Cost

- **$20m immediate investment**
- **Total <$100m p.a.**
- **<$2 per m^3 saved**

- Recycling is cheaper than desalination, but more expensive than relocating farmers
- Investment justified considering environmental effect

A Capital cost of rehabilitation based on estimates by Beisser (study commissioned by NWRA)
B Maximum figures based on international case examples for new build, including amortized capex.
C According to Sana'a Basin Action Plan

SOURCE: NWRA

In Taiz, Phase 1 of proposed desal plant viability needs to be confirmed & the investment gated to allow time for strategy development

Desalination in Taiz

Taiz is critically short on water

- Mains supply only every 45 days
- Population currently supplying basic needs from water trucked from distant wells ($4-$5 per m^3)

A desalination plant has been proposed by the private sector

- Reverse-osmosis plant in Al-Mokha
  - Phase 1: 50,000 m3 per day
  - Final capacity: 150,000 m3 per day
  - Cost $1 - $1.20 per m^3
  - Phase 1 could be complete by 2013[A]
- Pipeline to Taiz
  - Construction of 95 km, 28-inch diameter pipeline powered by 5 pumping stations along the route
  - Cost $1.05 - $1.20 per m^3
  - Financing supported by GCC donors

Phase 1 impact
- **~16m m^3 (50% of current gap)**

Phase 1 cost
- **~$40-$50 p.a.**
- **$2.5-$3 per m^3 saved**

- Initial economic analysis suggests **1st phase is feasible**, demand for water exists at this price[B]
- Investment **should be gated**, to allow review of requirement after full strategy development

Study into willingness to pay needed to confirm this

A Estimate
B Based on current price of water from trucks at $4-$5, and high willingness to pay of industry and domestic users for primary needs (~25litres/day)

SOURCE: Hail Saeed Group, GIA, team analysis

An emergency solution may be required for Taiz in the short term before desalination is introduced

PRELIMINARY

Taiz emergency solution

- Increasing volume of trucked water and decreasing price for the poor through targeted subsidy
- Decision on volume and price should be made based on willingness to pay study

Other no regret moves can reduce agricultural demand and increase the capture of rainwater

	Description	Rationale
Control drilling	▪ Decree 141 to control drilling enforced – Ban the import of rigs – All rigs kept in a central location – Operation only with permit – Offenders Severely punished ▪ Create law that non-renewable sources (fossil aquifers) may only be used for drinking	▪ Limits expansion of agriculture ▪ All long-term scenarios involve no agricultural expansion ▪ Limiting non-renewable use is first step to ending
Buy water from farmers	▪ Pilot launched to buy water from farmers in critical basins – Farmers given money in exchange for handing over wells and reducing cultivation – Water given to domestic use	▪ Need to determine viability of voluntary reduction through financial incentives
Rainwater harvesting	▪ Law passed enforcing rainwater harvesting in all new buildings ▪ Program to install harvesting infrastructure in homes, government buildings, industry etc.	▪ Cheap to install ▪ Evidence from e.g. India that high proportion of domestic needs can be met
Marib aquifer	▪ Understand costs of exploiting Marib aquifer – Cost of extraction and pumping – Opportunity cost (incl. how much is there) – Risks (e.g. insecurity of region)	▪ Potentially large source of water can feed Sana'a for 200 years ▪ Costs and risks large and unknown
Change agricultural market conditions	▪ Encourage imports of qat ▪ Remove diesel and electricity subsidies	▪ Reducing the profit margin of qat can discourage use of groundwater for agriculture ▪ Lifting subsidies is government policy

SOURCE: Team analysis, NWRA

Contents

- Long-term scenarios for Sana'a and Taiz basins
- Additional backup on roadmap for implementation
- **Mechanism for implementation**

There are multiple key questions that need to be addressed in designing an implementation mechanism for water reform

- What are the human capital requirements of implementation?
  - Number of people
  - Necessary skills and capabilities
  - Key roles (e.g. coordinating with donors, sourcing data, managing consultants)

- What are the governance requirements?
  - Reporting and follow-up mechanism
  - Access to decision-makers

- What current mechanisms within the Ministries can be leveraged? (e.g. coordination bodies, committees, secretariats)

- What are the legislative requirements to create the right implementation mechanism

For eg., in the long term the Ministry of Water has proposed a solution involving the redistribution of responsibilities between relevant Ministries

LONG-TERM SUGGESTION
BY MINISTRY OF WATER

	Ministry of Water & Environment	Ministry of Agriculture & Irrigation	Ministry of Provinces	Ministry of Electricity
Respon-sibilities	▪ Manage all water resources & the environment ▪ Make plans and policies ▪ Suggest laws ▪ Propose and license private and public water-related institutions	▪ Encourage agricultural production ▪ Management of irrigation-related institutions	▪ Management of sewage systems & sewage institutions ▪ Reporting to new independent oversight body on sewage ▪ Current responsibilities	▪ Desalination ▪ Encouraging private sector involvement in desalination ▪ Current responsibilities
Key change	▪ **Now in charge of all water resources management rather than just domestic and industrial**	▪ **Focuses on irrigation and production rather than water sources**	▪ **Now in charge of sewage** ▪ **Responsible to independent sewage oversight body**	▪ **Now responsible for desalination sector**

SOURCE: Minister of Water and Environment