KAPSARC

مركز الملك عبدالله للدراسات والبحوث البترولية

King Abdullah Petroleum Studies and Research Center

Squaring the circle: Saving money and water (energy?) in KSA

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Roadmap

- Water services in Riyadh are unsustainable
- Today, I'll describe possible ways to improve the situation
- These actions *may* also apply to energy

Environmentally	Fiscally: Sustainable	Fiscally: Unsustainable
Sustainable	New York, Amsterdam, Singapore... (governance win)	Manila, Dhaka… (wet but poor)
Unsustainable	Las Vegas, Los Angeles... (hot but rich)	Riyadh, Mexico City, Cairo… (governance fail)

"…flat tariffs charged at public water points were not benefiting the poor because of significant mark-ups charged by middlemen. It also showed that the intended consumption subsidies embedded in the tariff were actually benefiting customers who were already connected to the network, and not the poor who rely on kiosks or yard taps." – The World Bank, describing the situation in ~~Saudi Arabia~~ Uganda

Stylized facts about water in Riyadh (and KSA)

Water customers pay little for low quality and quantity

- Riyadh "service" is 1 day-in-7 (tankers and empty pipes)
- Big government subsidies
  - CapEx, e.g., $7 billion, 1 MCM/day Ras al-Khair desalination plant
  - OpEx, e.g., $3.2 billion/year (by one estimate)
- Groundwater supplies falling

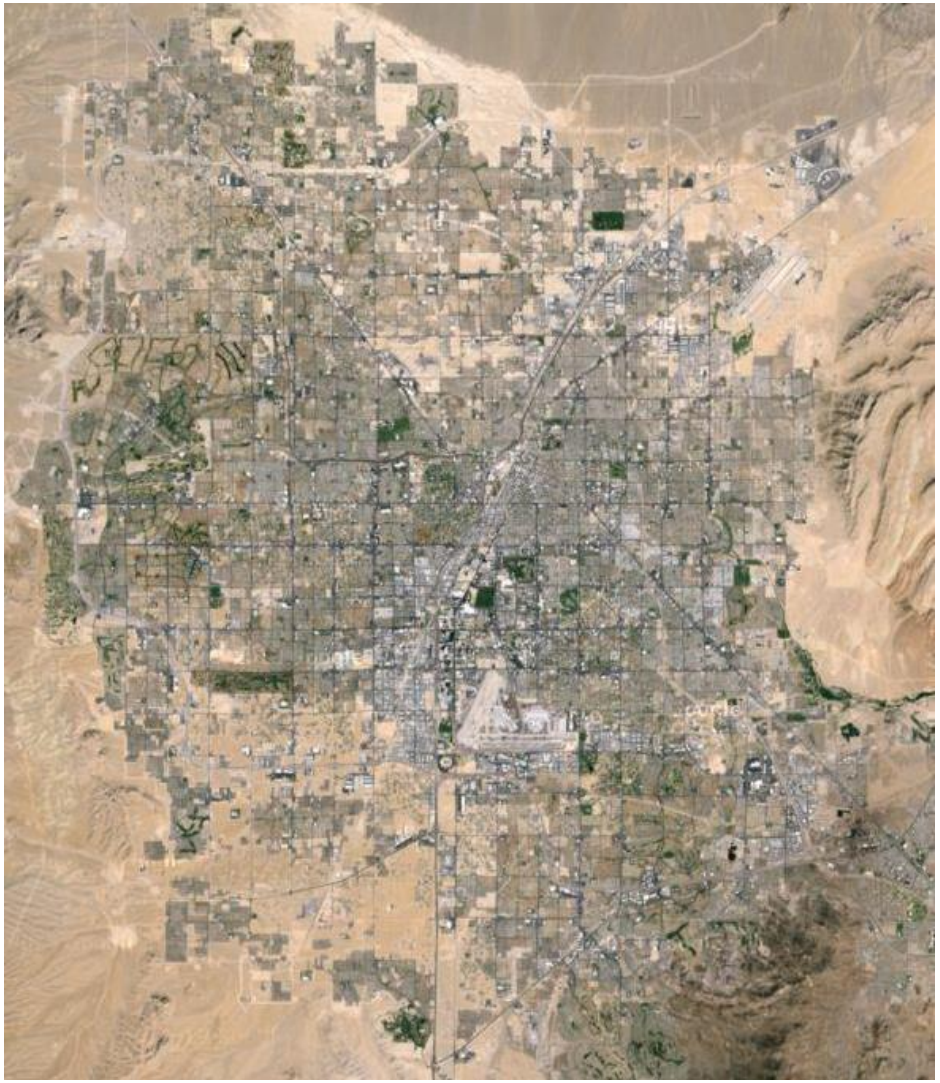
NB: Water problems worsen energy problems

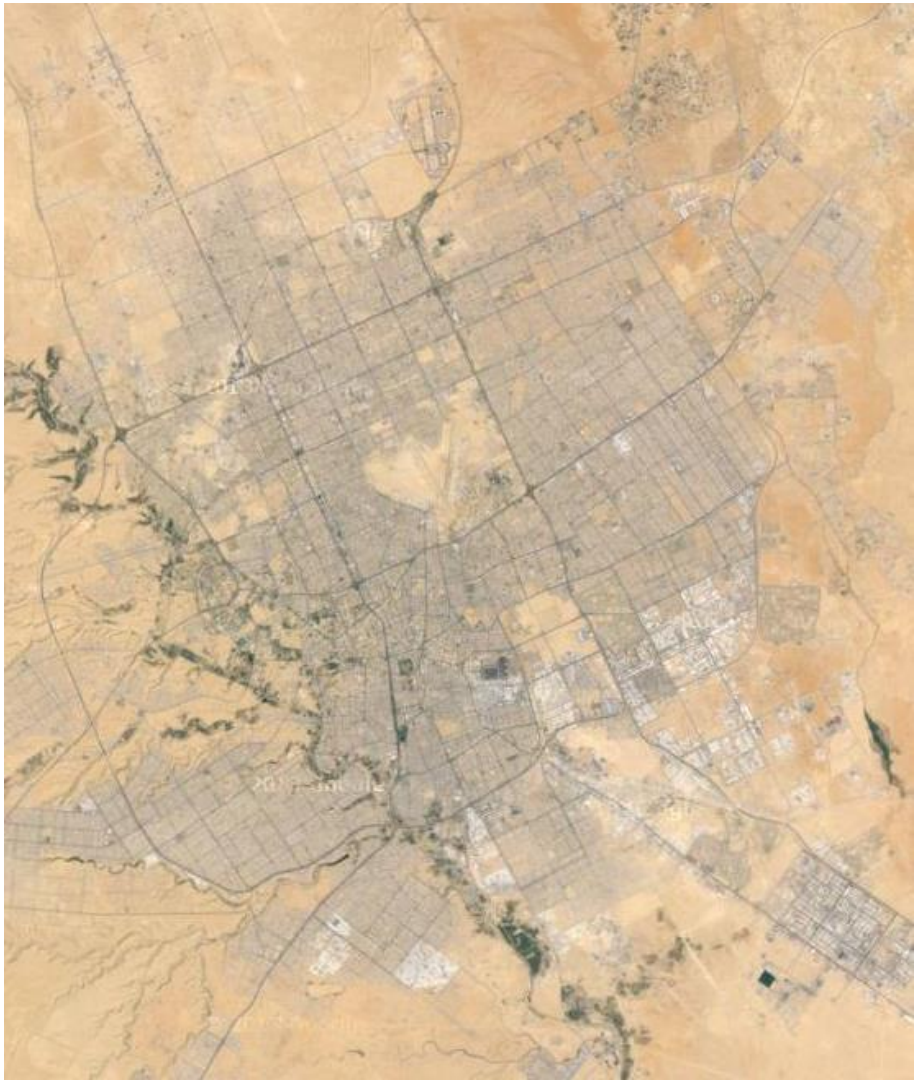
Aside: Almarai doing it right

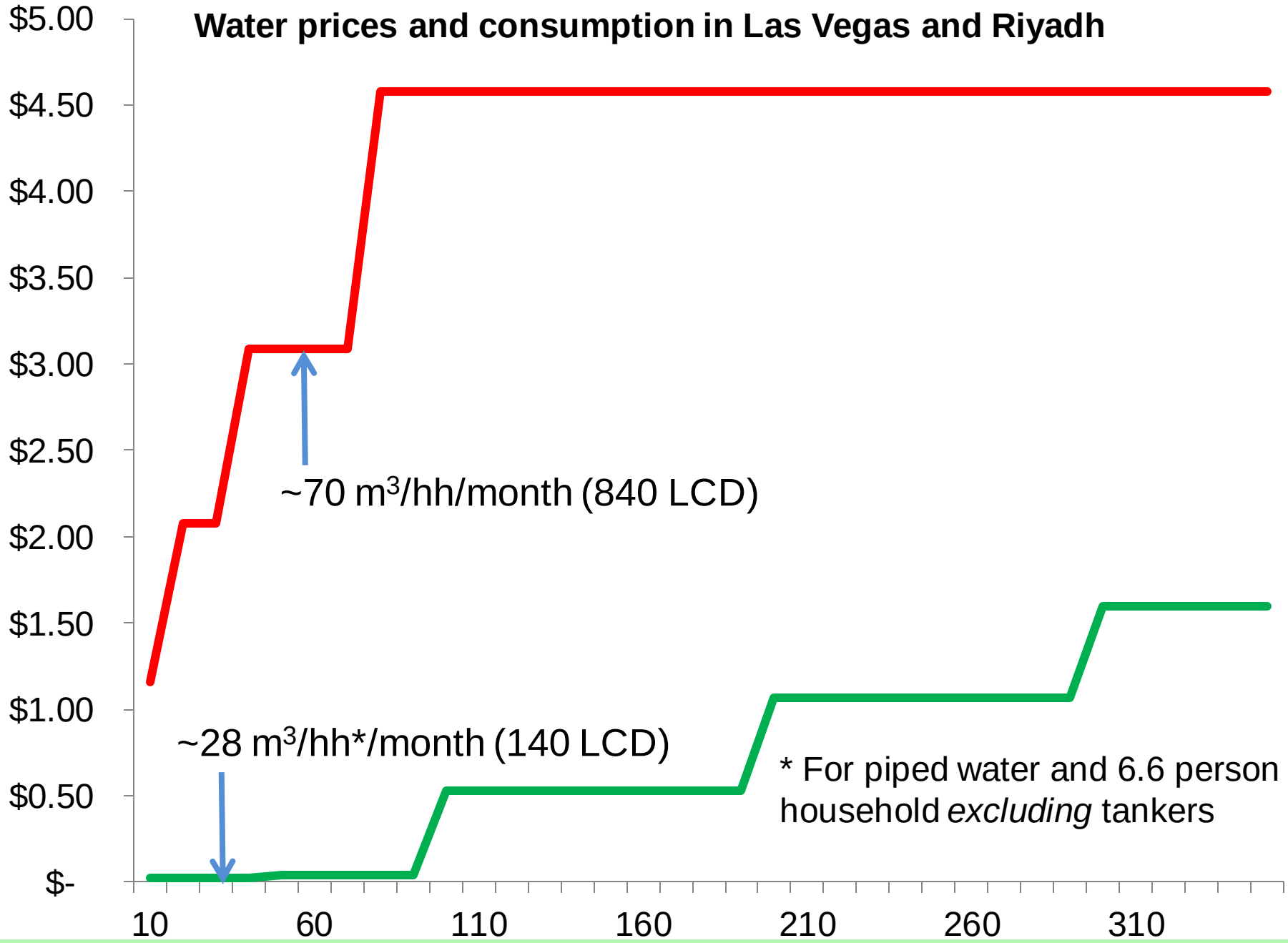
- 2009: Spends $250 million on HADCO and gets 1 MCM/day (3%)
- 2011: Promises to import feed for dairy exports (done)
- Mar 2014: Buys AZ farm to export (subsidized) alfalfa to KSA
- Apr 2014: Promises to import feed for domestic dairy

Barrier? Higher prices will "burden" poor

Context: a tale of two desert cities…






Water prices and consumption in Las Vegas and Riyadh
$5.00
$4.50
$4.00
$3.50
$3.00
$2.50
$2.00
$1.50
$1.00
$0.50
$-
10
60
110
160
210
260
310
~70 m3/hh/month (840 LCD)
~28 m3/hh*/month (140 LCD)
* For piped water and 6.6 person household excluding tankers

Vegas is better!

Demand is not "that high" versus Las Vegas, but…

- Highest use in the US (SFO ~400 LCD) but costs ≈ revenues (~$45/mo/customer) and supply ≈ demand

- Riyadh: consumption > supply and costs > revenue (~$2/mo)
  - Government losing money, mining water and using lot of energy
  - Service is terrible (intermittent, tankers, unsafe)

But there's a twist:

- Households: 1.15 million, of which 680k are "Saudi" and 470k are not
- Piped service to 400k households (assume "Saudi")
- Piped households pay about SAR 0.15/m^3 due to progressive tariffs
- Tanker households pay SAR 6.00/m^3 ("black market" price: 10-40/m^3)

Goals: protect supply, improve service and help customers

NB: After my talk, I learned that 400k hh "share" 2MCM/day w/ other hh, while official tankers deliver 0.05MCM/day. I am still trying to discover deliveries by black market tankers.

One tool per problem

Protect supply: set a minimum price of 0.50 SAR/m^3 (for example) to reduce stress on aquifers (56% of supply) and spending on desalination (44% of supply)

NB: A right to water implies that customers should be paid to use less. This second best solution could work, given existing huge subsidies.

Improve service: invest new revenue on reducing leaks

Help customers: move from tankers to grid will reduce monthly bills, illness, inconvenience and tanker dependency

These actions are revenue/subsidy neutral

Let's learn more about the customer mix…

Get out the back of your envelope

ECRA says piped customers use 140 LCD (+ 80 LCD for ICI) = 220 LCD but they ignore tankers. By another source, total use/population gives 265 LCD (includes ICI)

Playing with numbers, we get…

Type	HHs	via pipes	via tanker	ICI	Total LCD
pipe Saudi@6.6 pax	400,000	140	100	80	320
no-pipe Saudi @6.6	280,000	--	180	80	260
no-pipe@4.2	470,000	--	150	80	230
Total	1.15 mil			prorated:	265 LCD

Let's look at some scenarios…

NB: The conventional situation (higher prices) does not apply…*

…because there are two interrelated water markets.

* This is from my book. Did I mention I have a book (or two) that you may want to read?

Scenarios

1. Assume demand for piped (inframarginal) and tanker (marginal) water
2. Can only reduce tanker water by expanding network
   - Need higher revenues to expand the network
   - Higher piped prices can supply revenue
   - Higher prices raise the opportunity cost of leaks, which can also be fixed
3. So what's the impact of higher prices?

Inelastic (=0): Revenue reduces leaks (S up) and expands the network (D up)

Bill to existing piped customers goes from $2 to $6/month. Cost to new piped customers drops from $60-140/mo (SAR 6-15/$m^3$) to $6/mo

Elastic (<0): Lower demand and lower revenues BUT $$ from lower subsidies

Discontinuous elasticity (<-1): "Salience" strongly lower demand ($$$ saved!)

Bottom Line (via simulation): Higher prices can save $ and conserve water. Move to pipes>reduce leaks. Piped customers worried about $4/month increase may block (NB: mobile is ~$50/mo)

…but what about energy?

The energy side of water

- It takes energy to desalinate seawater, lift groundwater and transport water in the distribution system
- Tankers use far more energy (plus pollution and congestion), so shift to pipes saves energy unless increased water demand offsets
- Reducing leaks and/or water demand will reduce energy losses

This case (pipes/tankers) does not apply to electricity service:

1. Raise prices to reduce use of energy
2. Rebate excess revenue per hh
3. Lower demand reduces OpEx in SR and CapEx in LR
4. Saved subsidies can go to customers, more service, treasury, etc.