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*Does Water Metering Incentivize Pro Conservation Preferences: A Study  
from Urban Consumers in Lahore, Pakistan*

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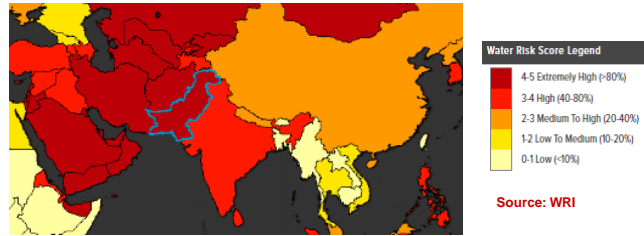
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## Objective

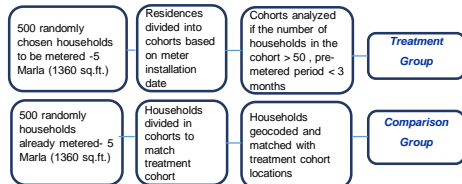
Pakistan is the sixth most populated country of the World. Within South Asia, Pakistan is the most urbanized country. Between 1990-2015, urbanization increased by 8% whereas urban population's access to water decreased by 3%. Lahore; second largest city with population of 10 million. Ground water is the sole source of supply; water table depleting by 1.5 feet annually. This study focuses on use of water metering mechanism to determine changes in consumption patterns of urban households of Lahore, Pakistan. The study indicates a reduction of water consumption in the range of 10-50% in four towns of Lahore.

## Why Pakistan?



Pakistan with its 200 million inhabitants is experiencing rapid urbanization and industrial development. Currently, it is the world's 26th most water-stressed country, where 35 per cent of the population lacks access to safe water. By 2025, the population is expected to cross 250 million, reducing Pakistan's per capita annual availability of water to 660 cubic meters.

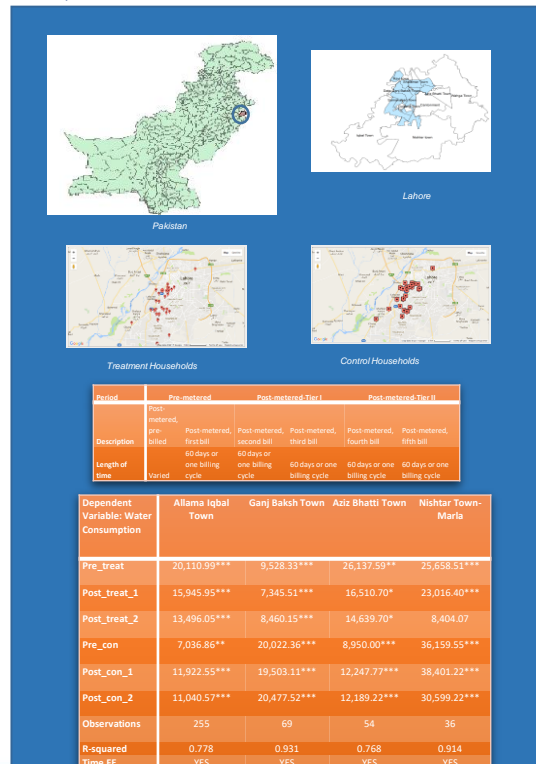
## Empirics



- Data: Household level metered water consumption record
- Using meter installation date, bifurcate dataset into two groups; households being metered for the first time and household already metered in previous years
- Controlling for various socio-economic factors and ensuring geographical proximity we uncover a treatment group – households being metered for the first time.

## Methodology

- Observations relating to treatment group can be considered as revealing consumption pattern of un-metered households, as treatment group has not yet internalized the effects of metering and thus has not changed its behavior with respect to water consumption.
- The control group – households already metered – will be used as counterfactual situation imitating the behavior of treatment group had they been already metered. We also check the robustness of our results by controlling for selection bias by matching techniques.
- Empirical strategy Inspired by (Tanverakul & Lee, 2015)



## Results

Results Summary	AI Town	AB Town	GB Town	NT-M Town
Un-metered average monthly consumption per household-gallons per day	463.22	433.70	285.15	579.72
Metered average monthly consumption per household-gallons per day	275.66	194.19	319.98	351.00
Difference between unmetered and metered households-%	68.04	123.33	-10.88	65.16
Short Term Meter impacts-Reduction after three months of metering-%	32.56	49.66	9.72	14.04
Longer term meter impacts-Reduction after six months of metering-%	38.20	55.22	8.90	33.61

During the pre-metered period, the treatment group used more water on average than did the comparison group in all towns.

After three months of metering, average monthly water consumption in the treatment group for all four towns decreased.

After six months of metering, long-term effects on residential water use were observed. These values reflect potential long lasting impact of metering residential water use. Water consumption in the treatment group that started out with higher consumption compared with the comparison group converged towards the similar volumetric monthly water use, which demonstrated a decrease in residential household water consumption after meter installation

## Literature Cited

- Luckmann, J., Grethe, H., McDonald, S., Orlov, A., & Siddig, K. (2014). An integrated economic model of multiple types and uses of water. *Water Resources Research*, 50(5), 3875–3892
- Abedel Khaleq, R. and Dziegielewski, B. (2006): A National Water Demand Management Policy in Jordan, *Management of Environmental Quality*, Vol. 17 No. 2 pp. 216-225.

## Conclusion

Sustainable provision of water in urban settlements is contingent upon the underlying regulatory mechanism controlling the resource use. Water being a natural resource suffers from the "tragedy of commons" and its management may entail a coercive mechanism as suggested by (Hardin, 1968).