Asian Development Bank - International Initiative for Impact Evaluation

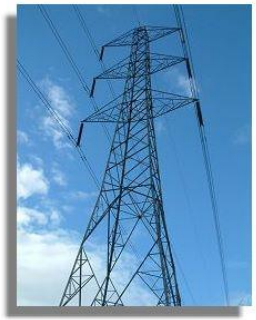
Video Lecture Series

# Impact evaluations of infrastructure sector projects and programmes

Howard White

# Is randomization possible?












# Yes, for many interventions it is


Off-grid electricity, can randomize at the household level (e.g. solar home systems) or community level (e.g. micro-hydro)

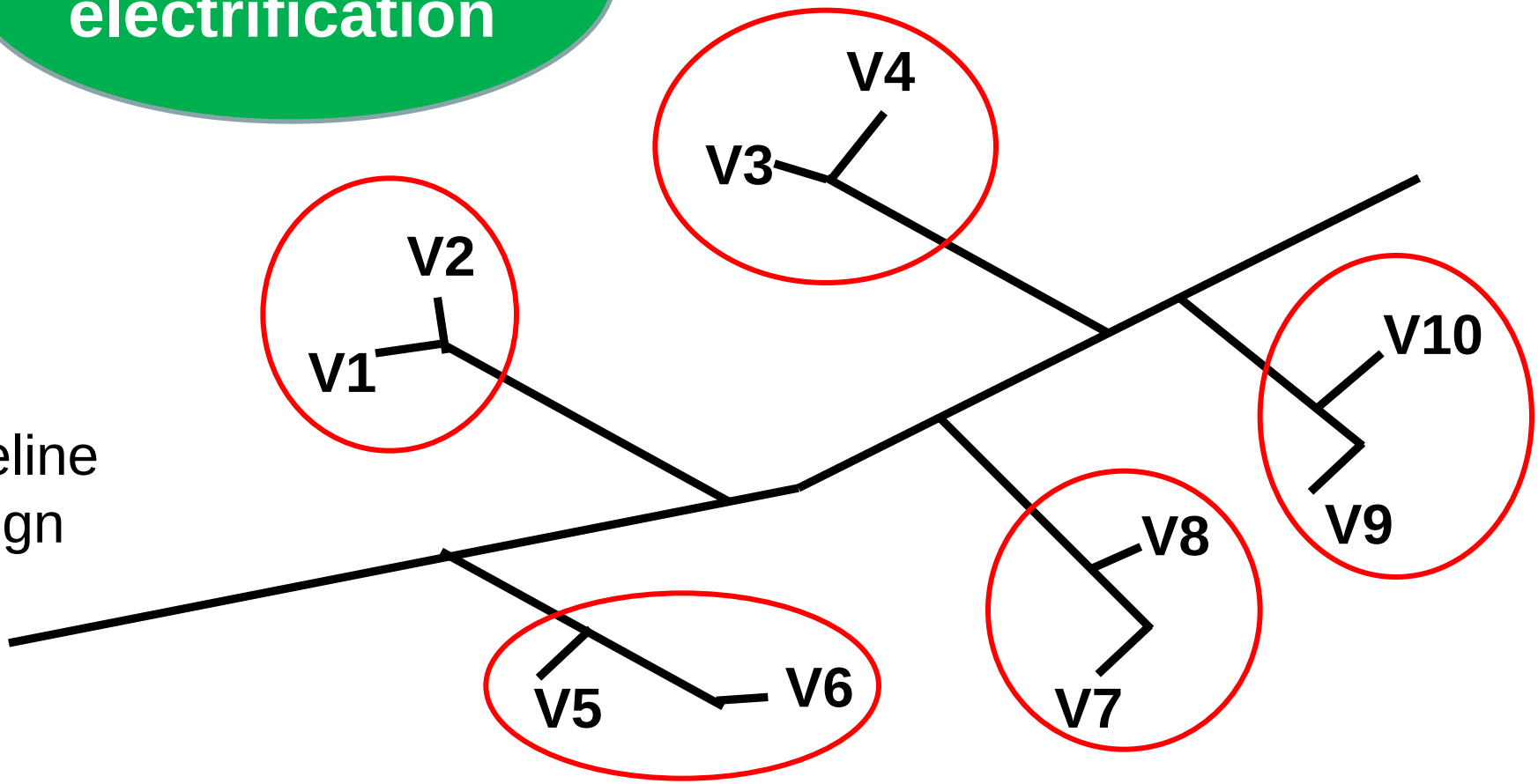

Urban development: slum upgrading, can randomize at household level (improved housing) or settlement level (community-level services, e.g. street lighting)


Water supply and sanitation: community (e.g. standpipes) or household (latrines, point of use water treatment)

# Even large scale infrastructure

**Rural electrification**

Matched pair randomization




Pipeline design

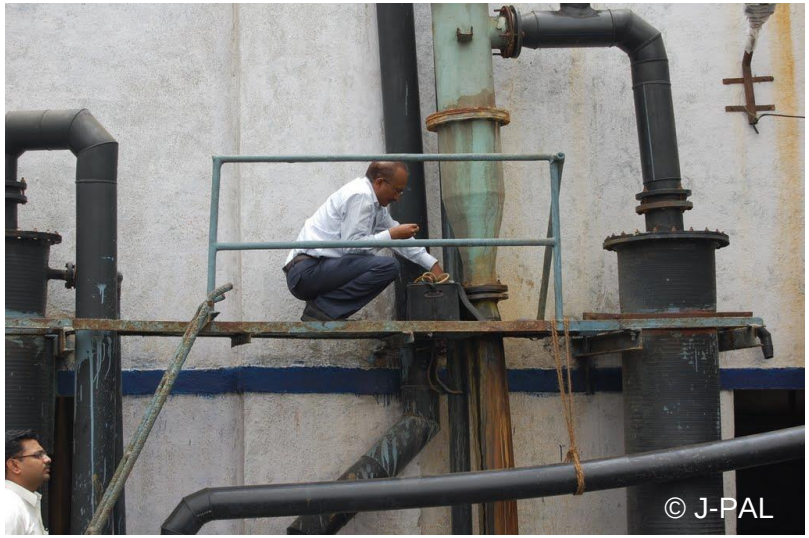
# Other possible random roll out

- Rural roads
- Rehabilitation(e.g. piped water system)
- Secondary or tertiary irrigation canals



# Or can examine policy reform

**New system of pollution auditing in Gujarat, India**

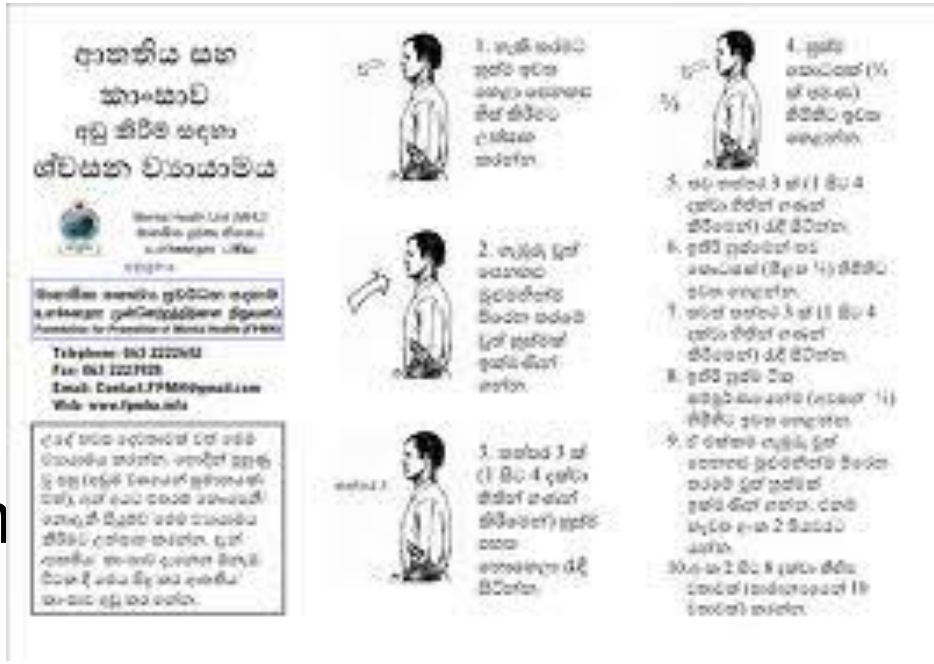



**Agricultural water pricing in West Bengal, India**

# And you can use an encouragement design

- Everyone is exposed to the treatment
- Random assignment is of encouragement, not the treatment
- But the encouragement must not affect the outcomes

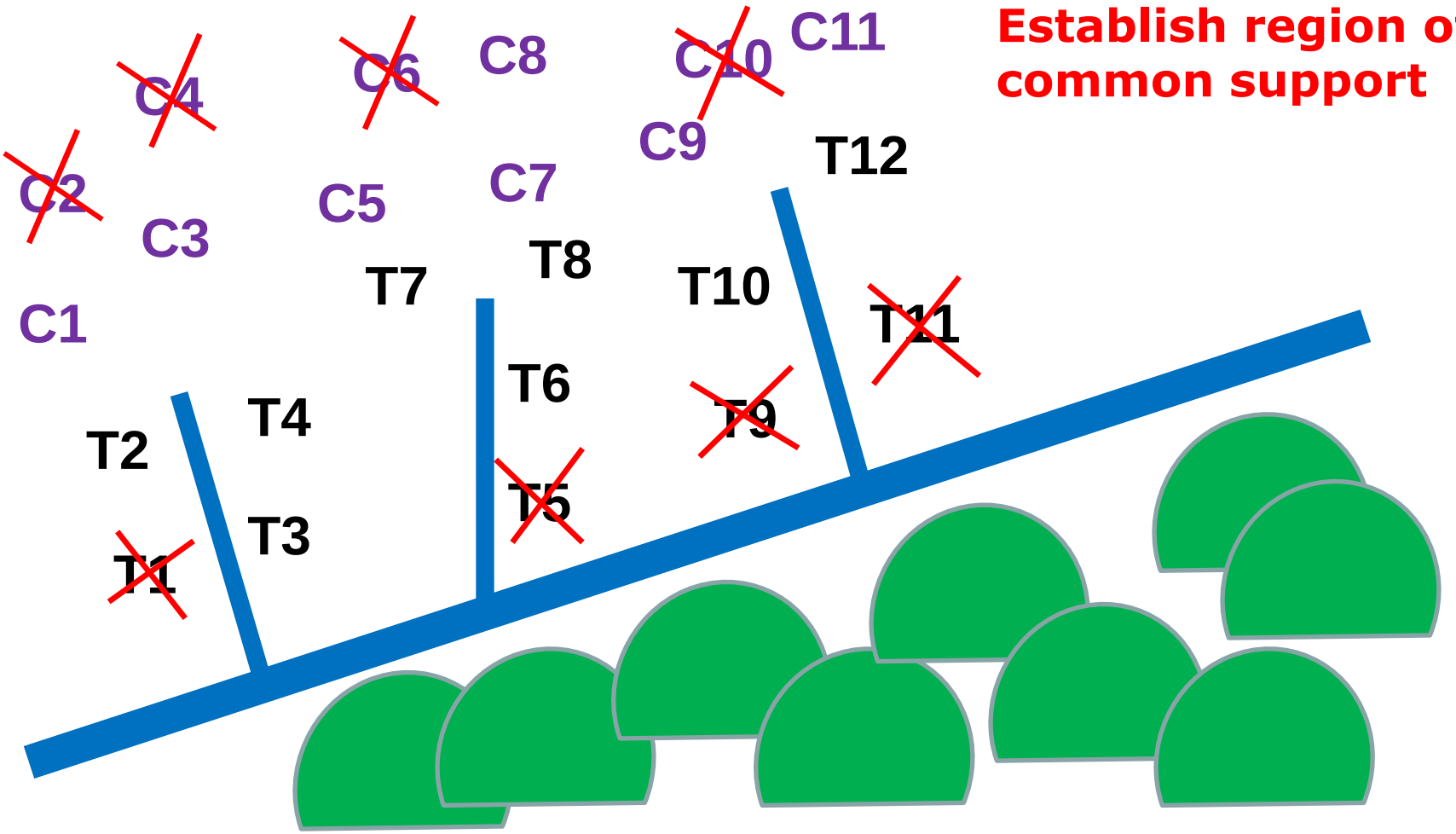
- Examples of possible encouragements are information or reducing transaction costs (randomized pricing is an encouragement design)



# Non-experimental methods can be used

- If randomization not possible because
  - Study is ex-post
  - Administrative or political difficulties
- Can use non-experimental design
  - E.g. Propensity score matching (PSM) at household or community level
  - Regression discontinuity of eligibility criteria for service subsidy
  - Preferably double difference

# Example: irrigation



# Balance achieved through PSM


## Access to improved water source in Nepal

| Variable | Before matching | After matching |
|---|---|---|
| Rural resident | Treatment: 29%<br>Comparison: 78% | Treatment: 33%<br>Comparison: 38% |
| Richest wealth quintile | Treatment: 46%<br>Comparison: 2% | Treatment: 39%<br>Comparison: 36% |
| H/h higher education | Treatment: 21%<br>Comparison: 4% | Treatment: 17%<br>Comparison: 17% |
| | | |
| Outcome (diarrhea incidence children<2) | Treatment: 18%<br>Comparison: 23%<br><br>OR = 1.28 | Treatment: 15%<br>Comparison: 23%<br><br>OR = 1.53 |

# Strengthening weak designs

- Triangulate
  - Different impact estimates from different sources
  - Qualitative sources
- Use theory of change to think who benefits and how
- Check the causal chain

# Example of Andhra Pradesh Irrigation

- Triangulation
  - Own survey double difference
  - Government data on irrigated and unirrigated *mandals* in treatment districts
  - Baseline report
  - Expert opinion
- Causal chain
  - Construction delays
  - Interrupted or insufficient water supply

# And what about large scale single investments e.g. ports and major bridges?

- Is the impact question the most important one? (also quality of construction, cost-effectiveness etc.)
- Will have made benefit estimates for ex-ante cost-benefit analysis, can test these with 'best available double difference' (going beyond before versus after)
- May well need computable general equilibrium analysis

# In summary

- Randomization is often possible
  - Of the intervention itself
  - Of a related policy issue
  - Or using an encouragement design
- Non-experimental methods will otherwise often serve
- If weak designs, buttress them
- And can apply these principles to large-scale infrastructure

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