Mechanism Design

15th December 2020

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A Simple Example

- **Problem**

Joe and Donald share a cake. How can we divide it in two in a fair manner?

- **Solution**

One (A) cut it into two halves and the other (B) select whichever he likes.

- **Why it is fair?**

"A" can make the difference as small as he pleases while "B" can take the one he prefers. => Envy-free

- **Game theoretic interpretation**

The rule is designed in such a manner that Joe and Donald's incentive to make their own portion as large as possible contributes to achieving a fair division, regardless they try to be selfish.

NIMBY Syndrome

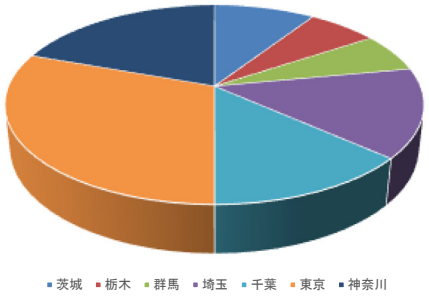
- The syndrome known as NIMBY (short for *Not In My BackYard*) designates any conflict involving the location of dangerous or nuisance-creating projects in places where local people can be expected to oppose their establishment.
- NIMBY-type reactions apply only to some of these projects, which generally have three characteristics in common.
  - Create nuisances at the local level.
  - Likely to produce sizable advantages, but on a broad scale rather than a local scale.
  - Often requires expropriations and changes in the environment.
- The response to the NIMBY syndrome from public authorities is a result mainly of centralized decision-making. Decision-makers select a site, announce the choice to the public, defend it and undertake the project by force, if necessary.
- Accordingly, the most promising strategy is to set up competitive compensation mechanisms both to respect the citizens concerned and to manage the NIMBY syndrome sustainably.

Mechanism Design for Competitive Compensation

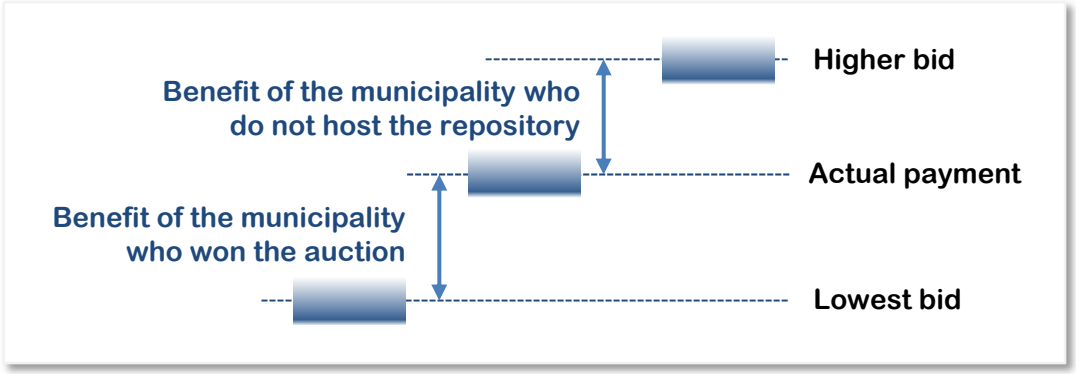
- Market mechanisms aim to be more “decentralized”.
- The idea behind this mechanism: Considering that a project is likely to provide significant advantages to the general public and also that the nuisances are essentially local, it is possible to picture the citizens or developers who benefit from the project compensating the likely neighbors.
- This approach is based on the principle that those subjected to the project are the only ones who really know the costs of its eventual advent. With various sites in competition to host (or not host) the project in return for compensation, an incentive will arise to disclose these costs and to volunteer (or not volunteer) in a perspective of mutual gain.
- Economists have suggested various auction mechanisms for overcoming the NIMBY syndrome.
  - Dutch reverse auction: the developer or government offers a level of compensation to representatives of the various potential sites. If there is no taker for the project, the compensation on offer is increased until a taker is found.
  - Modified low-bid auction: each group issues a bid for compensation for hosting the project on its territory; whichever makes the lowest bid hosts the project and gets the compensation; the other groups each pay a “tax” proportionate to their bid for compensation. Despite having to pay something, these groups all come out as winners in the auction: to avoid hosting the project, they will pay less than hosting it would have cost, based on their own assessments.
  - Modified high-bid auction: each group issues a bid for compensation, and whichever makes the lowest bid not only hosts the project but receives compensation equal to the highest bid for compensation; the other groups each pay a tax proportionate to their respective bids, with the total equal to the amount to be paid to the winner. Thus, none of the groups comes out losing in the auction, with the group hosting the project in effect achieving a net gain compared to its assessment of the cost of hosting it.

Application to accident waste disposal

- **Prerequisite**
  - Tokyo and 6 prefectures in Kanto area agree that each municipality shares responsibility to host a repository in proportion to its power consumption.
- **Auction mechanism**
  - Each municipality can either;
    - host a repository to accommodate their portion of accident wastes or,
    - issue a bid for compensation.
  - Among those who issue bids, whichever makes the lowest bid not only hosts the project but receives compensation equal to the mean value of the highest and the lowest bid for compensation, to achieve an “envy-free” state,

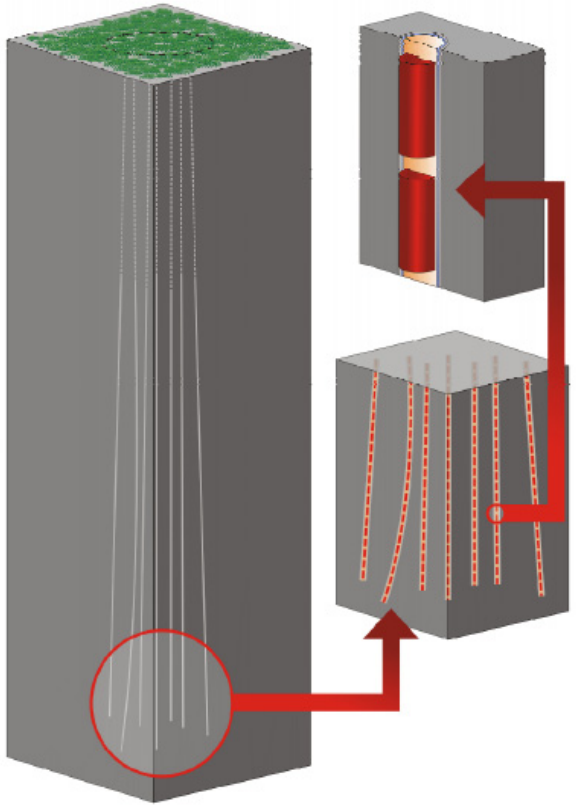


Power consumption of Tokyo and 6 prefectures in Kanto area



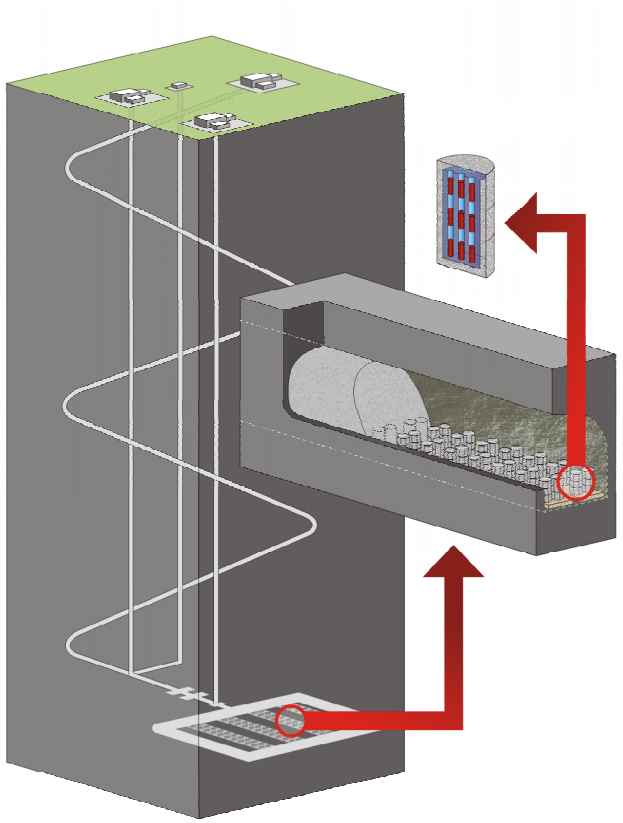
Menu of disposal options to enable the mechanism

Decentralized



- Very deep borehole
- Minimum infrastructure

Centralized



- Large cavern
- Engineered for efficient operation

Suggested readings

- Toyotaka Sakai, Fair waste pricing: an axiomatic analysis to the NIMBY problem, *Econ Theory* 50, 499–521 (2012).