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Notes on Project Evaluation

Carl D. Martland

Senior Research Associate & Lecturer

Department of Civil & Environmental Engineering

Massachusetts Institute of Technology

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Dealing with Uncertainty: Sensitivity Analysis, Scenarios, Partnerships

Projects are beset with risks and uncertainties. Dealing with risks and uncertainties is therefore a continual concern for the people, companies, and agencies that are developing or evaluating projects. Different types of risks and uncertainties are evident in different stages of a project's life, and different strategies are used to ameliorate the risks and uncertainties.

Although they may seem to be used interchangeably, risk and uncertainty refer to rather different concepts. Uncertainty is a general term that implies a lack of knowledge, so that we cannot make good predictions concerning what is likely to happen. The antidote to uncertainty is gathering more knowledge, whether by conducting research, making site visits and taking measurements, talking to experts, or building models. Risk is a more precise term that implies that we have some knowledge concerning the probabilities and consequences of various types of events. Risk is something that can be analyzed, as it is possible to make estimates concerning changes in risk as a result of changes in location, timing, design, or any other factor.

For a major CEE project, there are risks and uncertainties related to the engineering for the project as well as for the three broad areas of concern for sustainability, namely financial, social, and environmental. The main financial risk is that the project owners cannot find enough cash to construct, operate, or maintain infrastructure. Financial failure may occur before the project ever starts or, as with the French efforts with the Panama Canal, failure may be a spectacular international event that occurs after years of work and vast expenditures related to an unsuccessful construction effort. The main social risk is that the public, the courts, and/or government agencies rise up against the project and force it to be cancelled, curtailed, delayed or shut down. Environmental risks include disruption of ecosystems, unacceptable disturbances to abutters (which becomes a social problem), and unanticipated, non-sustainable environmental impacts (e.g. global warming and the future of the automobile).

The basic admonition for project planners is to understand all of the significant risks that the project faces and to investigate ways of adjusting the project so as to reduce the expected consequences to an acceptable level. Brainstorming sessions, historical comparisons, expert insights, public involvement and common sense all play a role in identifying and categorizing the potential risk and also the ways for dealing with the risks. Some of the questions that might be asked to identify risks and some of the methods that could be used to mitigate risks are outlined below.

Engineering Risks (structural failure)

- Questions related to risks:
 - What are the expected stresses on the infrastructure, and how will it respond to these stresses?
 - How will site conditions affect design and costs?
 - Soil characteristics
 - Fault lines
 - Ledges and boulders
 - Water table
 - How much margin of error should we include in our design?
 - Will the proposed technology actually work?
- Methods:
 - Site investigation
 - Understanding demands
 - Engineering modeling
 - Sensitivity analysis
 - Use of well-known designs, components, and materials

Political Risks

- Questions related to risks:
 - Will we be able to secure the necessary permits to build the structure?
 - Will the government agency honor commitments to help with financing?
 - Will a change in the government lead to problems for the project (e.g. termination of financial support, nationalization, higher taxes, new requirements for use of local labor, selection of different developer or construction firm)?
- Methods:
 - Choice of local partners
 - Long-term contracts
 - Employment of local labor and use of local suppliers
 - Public-private partnerships with clear definitions of responsibilities and a good process for resolving disputes

Construction Risks

- Questions related to risks:
 - Will the process work?
 - Will the materials be available when needed?
 - Will the materials be of sufficiently high quality?
 - Will there be major accidents?
- Methods:
 - Safety program
 - Supervision
 - Inspection of materials

Financial Risks

- Questions related to risks:
 - Will we have enough funds for construction?
 - Will there be enough funds for operation & maintenance?
 - Will there be enough funds to deal with unanticipated events?
- Methods:
 - Partnerships and contracts that share the risks
 - Insurance to cover the costs of disasters (e.g. earthquakes, fires, storms)
 - Project management
 - Cost models and cost controls
 - Sensitivity analysis
 - Market studies
 - Staging (get some revenue early on; allow for easy expansion)
 - Careful bidding for projects: include a margin of error, so that you can survive even if things go wrong.

Social Risks

- Questions related to risks:
 - Will protests from abutters or others be sufficient to cause delays, restructuring, or cancellation of the project?
 - Will political leaders support or oppose the project?
 - Will the government take over the project once it is completed?
 - Will the government regulate the project once it is completed?
 - Will the government intervene in pricing decisions?
- Methods:
 - Encourage public participation in process
 - Anticipate problems and work out ways to compensate people for problems that cannot be avoided
 - Transparency: make public aware of what is being done, why it is being done, and how the project will help the region
 - Use local labor and suppliers