REGIONAL ECONOMIC EVALUATION OF PBEE

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1. One of the most important applications of economic analysis is the *evaluation* of proposed projects and policy measures, subjecting them to a benefit-cost analysis (BCA) test. A related but *different* approach involves *regional economic impact analysis*.

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2. Whereas benefit-cost analysis can be used to rank policy measures in terms of their *efficient use of resources,* impact analysis measures how far these measures *deviate the local economy from current performance* levels. Examples: widely reported *multiplier analyses* used to show some multiple of the annual expenditures will enhance regional income because of various ripple effects.

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3. Either approach lends itself to Performance Based Earthquake Engineering (PBEE). Each is capable of considering the *performance of the economic system* and how it is impacted by various policy (mitigation, management, or reconstruction) measures.

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4. Considerable earthquake engineering literature devotes itself to the estimation of "direct" damages (usually defined as structure damage) from a past or expected natural disaster. These estimates become benchmarks for calculating possible loss reductions (benefits) from mitigation or response measures -- which can be weighed against the costs of achieving these reductions.

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5. This approach is *not* adequate for many reasons, including the fact that losses also have a time dimension: *for how long will the services of the facility be diminished?* (The latter are often labeled "indirect" effects, a misleading descriptor because indirect has a slightly different meaning in the regional economic impact assessment literature.)

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6. Policy analysis relies on a *full accounting* of losses before any plausible policy recommendations can be made. A full accounting supposes the ability to trace the full effects of the losses of any facility through the complex regional economy.

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7. While comprehensiveness is important, so is detail. Policy makers are probably better equipped to proceed if specific impacts on industries and/or communities can be reported.

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8. This survey suggests 15 criteria by which 19 accessible regional economic impact models (REIMs) can be evaluated insofar as they expedite PBEE. The analysis of how well alternative models rate on these criteria helps us to assess their contribution to PBEE.

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9. Fundamental question: How well do the models consider the performance of structures (broadly defined to include infrastructure and lifelines) *in their role of facilitating regional economic performance*?

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10. Of the 15 criteria, we attached particular importance to whether the models were readily useful in an interdisciplinary approach *and* whether they were capable of generating results for small areas.

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11. Created Evaluation Summary Table, identifying the *most important criteria*, and then successively applying these criteria as screens to eliminate models that do not meet this minimal test.

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12. PEER's approach to PBEE stresses the link between ground motion, structural response, and system performance. Our discussion highlights the importance of an *appropriate definition and modeling* of the *system at risk* about which decisions must be made.

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Table 1: Summary Regional Economic Impact Models Evaluation Matrix

Evaluation Criteria*			Models																	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Model Structure	Policy Relevant		2	2	2	1	2	1	2	2	2	2	1	1	1	1	2	2	2	2	2
	Spatial	Intra-regional	2	2	2	0	2	1	1	2	0	0	0	0	1	0	2	0	2	2	2
		Inter-regional	0	2	2	1	2	2	2	1	0	0	2	0	1	1	1	0	2	2	2
	Inter-industry		2	1	2	2	2	2	2	2	1	2	2	2	2	2	2	0	0	0	0
	Integrative (especially wrt infrastructure)		0	0	1	1	1	1	1	2	0	1	1	1	0	1	2	1	1	2	2
	Dynamic	Time treated explicitly	2	1	0	2	2	0	0	0	2	2	0	0	0	2	0	0	2	0	0
		Applicable to More than one time period	2	1	2	2	2	2	2	2	2	2	0	0	2	2	1	2	2	2	2
	Endogeneity	Price Adjustment	1	0	0	2	2	0	0	0	1	1	2	2	2	0	0	0	0	0	0
		Technology	0	0	0	2	1	0	1	0	0	1	0	1	0	0	1	0	0	0	0
		Travel Behavior	1	1	0	0	0	0	0	2	0	0	0	1	1	0	0	0	2	2	2
Model Functionality	Transferable		1	2	2	1	2	2	2	2	1	1	2	1	2	2	2	2	1	2	2
	Operational		1	2	2	1	2	2	2	2	2	1	1	2	1	2	2	2	2	2	2
	Accessible		1	0	0	1	0	0	0	2	1	1	1	1	1	2	2	2	1	0	1
	Updatable		1	1	1	1	1	1	1	2	1	1	1	1	1	2	2	1	1	1	1
Application **			B	A	B	C	C	C	A	A	B	C	C	C	C	A	A	B	C	C	C

* Definition of the Scale of the Evaluation Criteria : 0 = No, 2 = Yes, 1 = Somewhat

** A : has been applied to earthquake, B : has been applied to other natural hazard, C : neither