Economic Considerations for a Water KEGA+

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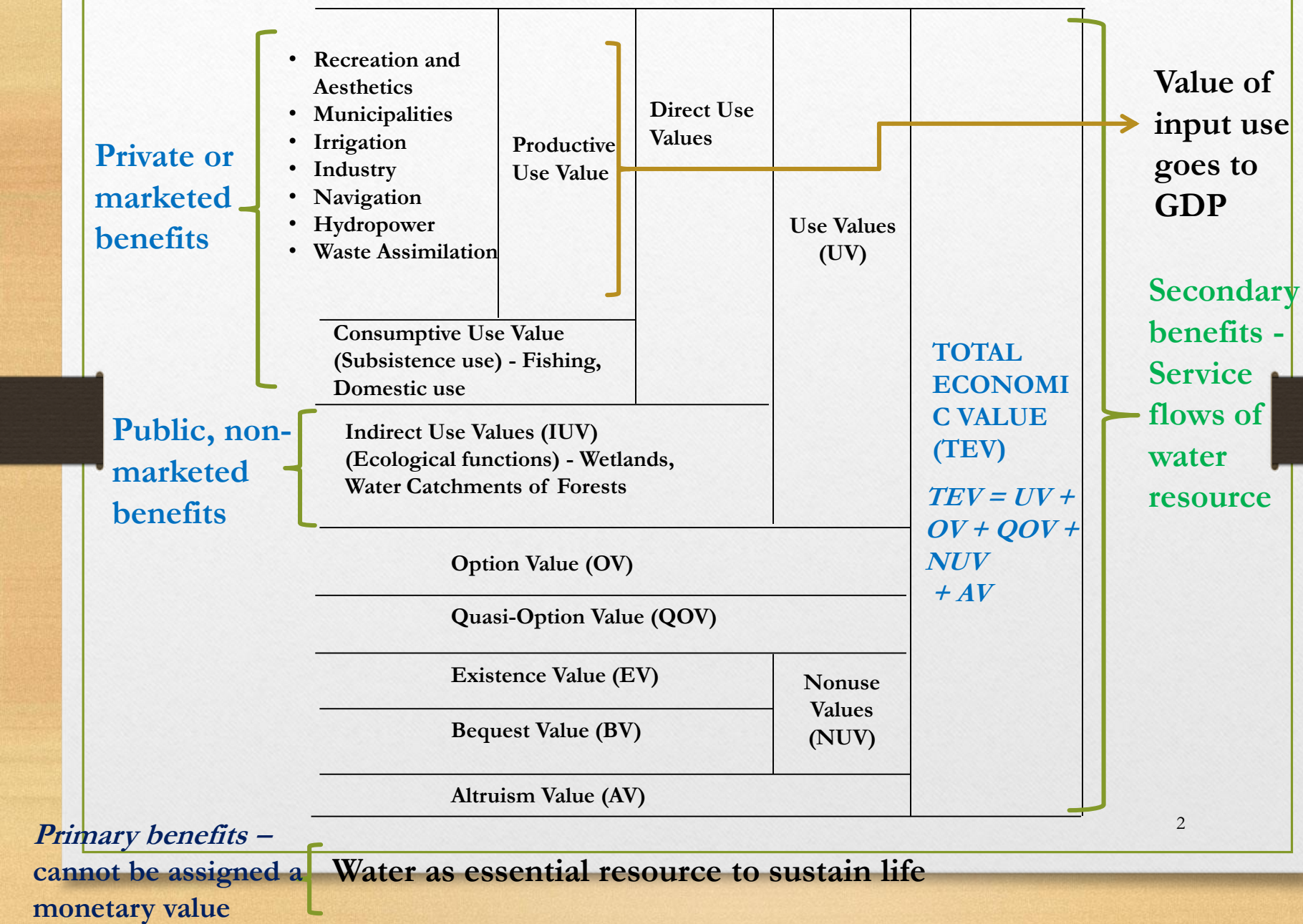
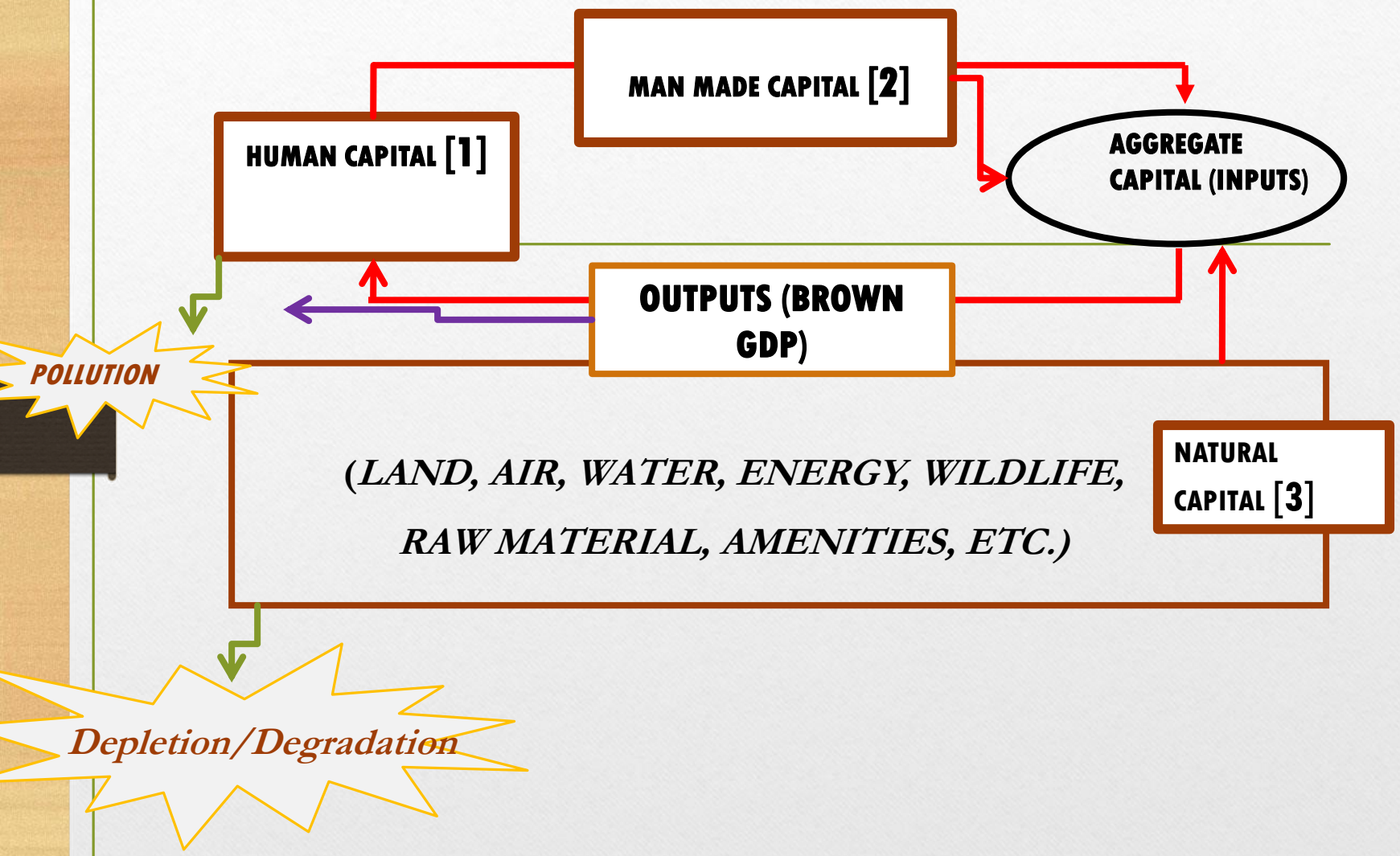
Components of Economic Values of Water Resource



Economy [GDP]- Environment Linkages



GDP underestimates the environment

- Ignores depletion of natural capital
  - Akin to the emphasis on gross income in company profiles, disregarding operating costs and changes in net assets.
- Ignores environmental resources and ecosystem services
- Ignores socio-economic inequity
- Ignores social capital
- Pollution and ecological degradation may lead to increased GDP figures;
  - When cleanup costs are incurred by the public sector, GDP increases.
  - Haze pollution may cause illness and productivity losses. But, it also stimulates the medical industry which leads to GDP increases.
  - Construction of a dam degrades biodiversity, but enhances investment and value adding activities. Subsequently, GDP increases.

Example of an Oil Spill Clean Up

	Activities /Impacts	Effects on GDP
1.	Extraction of oil from the ground	Increase
2.	Transportation of oil	Increase
3.	River clean up expenditures	Increase
4.	Wild life/aquatic biodiversity damages	No change
5.	Value of commercial fishing	Decline
6.	Repair of truck	Increase

What Economist Measure ?

General System	Ecological System	Economic System
Stocks	Structural Components	Assets
Flows	Environmental Functions	Services
Organization	Biological Diversity	Attributes

Primary benefits – incommensurables

Valuing the environment essentially means valuing the service flows or the functions of the environment

Marginal valuation approach

- **Valuation of water – some case studies in Malaysia**

Impact of 20% increases in water tariff

- General equilibrium model employed
- Results;
  - GDP declines slightly (0.5%)
- Insignificant as price of water has been largely underestimated (not captured in GDP accounts)
- Productivity or production function approach – better approach to estimate economic benefits of water

Malaysia - share of water value added to GDP (2005 and 2015)

Items	RM ('000) 2005	RM ('000) 2015	% of GDP (2005)	% of GDP (2015)
Value added of water transport	**4,454,199**	**5,922,677**	**0.87**	**0.52**
Value added of water works	**4,475,887**	**3,556,526**	**0.88**	**0.31**
Value added air transport	*1,999,718*	*5,514,359*	*0.39*	*0.49*
Value added electricity and gas	*9,389,051*	*25,809,527*	*1.84*	*2.29*

Share of water input to total intermediate inputs (2005 and 2015)

Items	RM ('000) 2005	RM ('000) 2015	% of total intermediate inputs (2005)	% of total intermediate inputs (2015)
Total intermediate inputs	729,583,619	1,221,226,970		
Air transport	*11,473,216*	13,832,395	*1.57*	*1.13*
Water transport	**11,786,197**	7,791,655	**1.62**	**0.64**
Water works	**2,035,321**	3,195,604	**0.28**	**0.26**
Electricity and gas	*17,460,463*	37,482,734	*2.39*	*3.07*

Value of water inputs to total intermediate inputs in Paddy sector =0.13% and to output value =0.013%

#Conventional statistics grossly underestimate the importance and larger benefits of water

Implicit prices (MYR) for IWK services and environmental attributes (Selangor State)

Attributes	Implicit Prices (MYR)							
	Developed District		Moderately Developed District		Less Developed District		Overall Study Area	
	M 1	*M 2*	*M 1*	*M 2*	*M 1*	*M 2*	*M 1*	*M 2*
TIME (*marginal improvement of standard waiting time by 12 hours)*	**0.27**	**0.80**	**0.21**	**0.21**	**0.50**	**0.57**	**0.12**	**0.12**
ODOUR *(Marginal improvement of distance of facility from residential areas by 50 meters to avoid complaints such as odour nuisance and visual disamenity)*	**0.01**	**0.02**	**0.29**	**0.30**	**0.31**	**0.38**	**0.22**	**0.23**
EFFL *(Treatment of effluent at the end cycle of sewage treatment to meet the DOE for emission into a body of water or river)*	**0.96**	**0.97**	**1.14**	**1.14**	**0.79**	**0.78**	**1.03**	**1.03**
ENV *(Treatment* of s*ludge that results in marginal environmental improvement (60-80%)*	**0.37**	**0.37**	**0.30**	**0.30**	**0.14**	**0.14**	**0.30**	**0.30**

Note: M 1= MNL basic model; M 2= MNL extended model

SOURCE: Chandramalar Munusami. **USING CHOICE EXPERIMENT TO ESTIMATE THE VALUE OF IMPROVED WASTEWATER TREATMENT AND SERVICE IN SELANGOR. Ph.D thesis (unpublished), UKM, LESTARI 2016.**

Value of potable water quality improvements

Estimation of averting costs for potable water quality improvements (case of Kajang Municipality)

Types of costs	Mean value
Buying and installing water filtration system cost (C_1)	141.03
Servicing water filtration cost (C_2)	0.17
New and changing water filters cost (C_3) (	44.18
Distance cost for buying treated water (C_4^1)	5.77
Time cost for buying treated water (C_4^2)	0.466
Cost of boiling water (C_5)	132.28
Total cost (WTP^t) (per household)	322.22

Estimation of present value of aggregate water quality improvement benefits derived by the Kajang community

	MYR
Kajang's population (person)	351,110
Household size (person)	4.82
Present value (discount rate =0.03)	768,279,563
Present value (discount rate =0.05)	509,669,220
Present value (discount rate =0.08)	301,478,763

SOURCE: Jamal Othman, Goh Hong Lip & Yaghoob Jafari , International Journal of Water Resources Development (2014): Benefits valuation of potable water quality improvement in Malaysia: the case of Kajang Municipality, International Journal of Water Resources Development, DOI: 10.1080/07900627.2013.876851

VALUE OF RIVER WATER QUALITY IMPROVEMENT

Case of incinerator and sanitary landfill in Broga

Attribute	**Generic**		**Label**	
	MNL (Basic model) (RM)	*MNL (Extended Model) (RM)*	*MNL (Basic Model) (RM)*	*MNL (Extended Model) (RM)*
PSYCHOLOGICAL FEAR	3.27	3.16	2.18	2.12
LAND AREA	0.31	0.23	1.59	1.44
AIR POLLUTION	1.81	1.78	2.43	2.38
RIVER WATER QUALITY	**4.83**	**4.91**	**3.58**	**3.63**

Pek-Chuen Khee and Jamal Othman. A choice experiment analysis for solid waste disposal option: A case study in Malaysia. Journal of Environmental Management 92 (2011) 2993-3001

Status quo and scenarios of improved disposal plans

Attributes	Status quo	Improvements		
	Option 1/ CT	**Scenario A**	**Scenario B**	**Scenario C**
PSYF	High	Negligible	Negligible	Low
LAND	Average 13 ha	90 ha	16 ha	25 ha
AIRP	46 µg/m^3	Reduce 10%	Reduce 10%	Reduce 5%
RWQL	Polluted	Clean	Clean	Slightly polluted

Estimates of household WTP for extended models

Alternative management scenarios	WTP (MYR per month) Generic form	WTP (MYR per month) Label-specific form
Scenario A	7.2	15.9
Scenario B	7.9	11.6
Scenario C	-2.3	6.3

MATANG MANGROVES - NON MARKET ATTRIBUTES AND IMPLICIT PRICES

Attribute	MNL (Model 2) RM	Nested Logit RM
ENV. FOREST AREA (% increases)	0.71	0.81
EMPLOYMENT (% increases)	0.99	1.36
MIGRATORY BIRD SPECIES (% increases)	0.84	0.92
RECREATION VISIT RATE (% increases)	0.05	0.06

Jamal, O., Bennett, J., Blamey, R., 2004. Environmental values and resource management options: a choice modeling experience in Malaysia. Environment and Development Economics 9, 803-824.

IMPACT OF WATER SUPPLY DISRUPTIONS ON RICE PRODUCTIVITY IN MALAYSIA

	Unstandardized Coefficients		t	Sig.	Collinearity Statistics	
	B	Std. Error			Tolerance	VIF
Constant	.155	.276	.563	.573		
LNLAND	.123	.013	9.556	.000	.728	1.374
LNFERTCOST	.102	.021	4.958	.000	.820	1.220
LNMANHOUR	.834	.030	27.917	.000	.722	1.386
LNCHEMCOST	.020	.011	1.853	.064	.758	1.319
LNSEEDCOST	.164	.030	5.388	.000	.937	1.067
D_GroupFarm	.015	.018	.855	.393	.756	1.323
D_MiniEstate	.023	.023	.987	.324	.769	1.300
D_RiceBowl	.189	.017	10.998	.000	.831	1.203
D_Commercial	.029	.028	1.014	.311	.891	1.122
D_LandLeveled	.000	.020	-.030	.976	.941	1.063
D_ChemImpact	-.093	.027	-3.453	.001	.968	1.033
D_VisitsAgents	.008	.019	.395	.693	.731	1.368
D_AttAgencyCourse	.062	.020	3.128	.002	.711	1.406
D_SatisfiedServc	.029	.022	1.350	.177	.835	1.198
Index_GAP	.385	.091	4.234	.000	.700	1.428

[a] **Dep variable: LN Output Per Hectare, 1800 respondents (2009 Survey, Peninsular Malaysia only)**

A decline in GAP index by 1 unit decreases productivity by 0.385 percent

SOURCE: Jabatan Pertanian Malaysia., 2011 Kajian Sosio-Ekonomi Peranan Pembekal Perkhidmatan dan Perlaksanaan Amalan Pertanian Baik dalam Sektor Padi di Semenanjung Malaysia.

PAYMENT FOR ENVIRONMENTAL SERVICES (PES)

- ***Application of environmental valuataion***
- ***PES is consistent with the Coase Theorem***

Payment for Environmental Services (PES) - Success factors

- Criteria and indicators of environmental services
- Willingness and affordability of users to pay/contribute
- Cooperation and participation from private sector and the general public/society
- Clear legal provision, regulations, policies and good institutions/governance in support of PES
- Trust in the system and the concept of PES in creating social capital

PES - PRACTICAL MATTERS FOR MALAYSIA

- PES is only complementary to conservation efforts, not a substitute.
- PES aims to provide incentives to the communities for conserving the environment, not as a burden.
- PES sites need to establish clear , unambiguous case of "supply-demand " for environmental services
- Emphasize participatory, bottom up approaches.
- Funds from PES may come from multiple sources, incentives to induce contributors may be necessary
- Legal basis and associated regulatory provisions are imperative.
- Criteria, guidelines and indicators of environmental services imperative.
- Custody agency – who shall be?
- Importance of environmental valuation – capacity and integrity, best practices case studies. Need clear national judicial sanction.
    - An important headstart - environmental benefit-cost analysis component in EIA processes has been made mandatory, while standardized guidelines were developed for practitioners.
- The Renewable Energy Act 2011 is an important impetus – establishes the Renewable Energy Funds for FIT Scheme.
- Good and trusted governance/institutions are imperative to avoid conflicts
- Consider contribution to PES funds as part of CSR or environmental performance of firms, but that doesn't inhibit their responsibilities to optimize environmental externalities, nonetheless

Concluding Remarks

- Discussions
  - Satellite accounts for water related industry, to complement existing I-O and SAM tables
  - Full cost pricing for water use, to consider environmental impacts
  - Importance of Beyond GDP indicators – for instance Genuine Progress Indicator
  - Environmental valuation in project analysis – economic values compel decision makers to think in terms of $ and cts
  - PES pilot projects
  - Water security policy
  - Improve water governance and accountability – covering all aspects