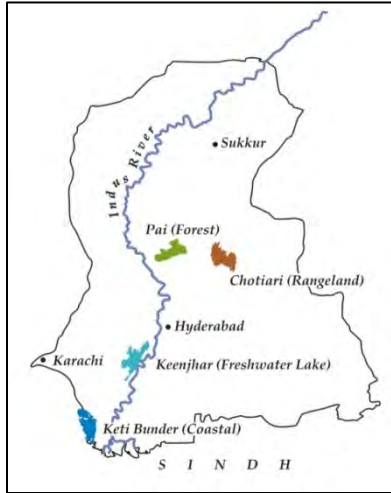# Methodologies, Data Needs, Applicability of TEVs

Ali Dehlavi, Economist
WWF-Pakistan

UNEP Regional Workshop
6-9 Feb 2012, Bangkok

Is Conservation Worthwhile?

Ecosystem Values (Present Value, USD m)				
2012 February	**DUV**	**IUV**	**NUV**	**TEV**
Deltaic (Keti Bunder)	99.5	7.8	4.2	111
Rangeland (Chotiari)	27.1	-	27.1	54
Freshwater (Keenjhar)	83.7	76.9	4.2	165
Forest (Pai)	9.0	0.9	20.8	286
Agriculture (Pai)	255	-		
Total	**474**	**85.6**	**56.3**	**616**

Source: inflation adjusted figures based on WWF 2008 and SANDEE 2011 (All values calculated using a 10% discount rate; assumes a limitless time horizon)

Valuation / Accounting studies

Surveys: 6 including 1 in Karachi (Feb-July 08)

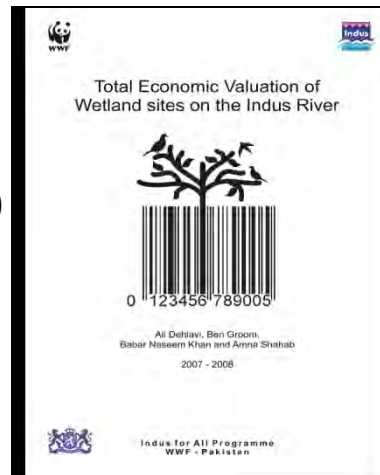Report: 5 valuations, 1 green accounting paper

Spinoff publications: 2 (IFPRI, UCL Economics Dept)

50 yr Vision: SANDEE grant, MoE guidelines, ADP

Guidance Notes: 8 on methodology, sampling, etc.

National Workshops: Mar 09, Apr 10, etc.

Skills: WWF-P staff trained (4-12 Nov 07, 12-19 May 08), SANDEE Research & Training Workshops (2008-2011)

Who would have guessed…

Keti: Rs. 13.8 Bn/USD 153m (yearly fish income)

Keenjhar: Rs. 2 Bn/USD 22m (yearly fish income)

Karachi: WTP for 4 sites = 1/5 of Pai's worth

Karachi: don't care for CBO management

Karachi: WTP for Chotiari/Pai species only

Keenjhar: IUV for Rs. 1.2m/USD 14k "residential"

Pai: carbon value of Rs. 51m/USD 568k (1/8 of Keti)

Anatomy of a TEV

Work plans   STATA-10

1. Define TEV objective
2. Identify peculiarities (geographic, biophysical, economic)
3. Define analytical & geographic boundaries
4. Profile villages
5. Identify components / assets, functions / services, diversity / attributes
6. Select models within techniques
7. Select and apply Sampling strategy
8. Design questionnaires
9. Create reusable Datasets

10. Specify and calibrate models
11. Define Overall TEV Computation model
12. Collect and combine with SEB data, DUV / IUV / NUV data (primary & secondary!!)
13. Analyze results
14. Interpretation of results

Study

Keenjhar: STDC operated reserve

Location: Thatta district, Sindh. (120 km from Karachi)

Activities: Swimming, rubber tube rental, etc.

Threats: Upstream effluents, vehicle grease, etc.

Policy: Estimate of recreational value of the lake which could be used in assessing returns on conservation investments

Growing policy uptake of valuation in Pakistan

• Altaf et al. (1992): residents willingness to pay for piped water supply in rural Punjab

• Khan (2004): 1 DUV – national park (subtropical flora)

• World Bank (2006): 8 TEVs – deforestation, rangelands, soil salinity/erosion, water, airborne lead & urban/indoor air

• WWF – Pakistan (2008): 5 TEVs – coastal, freshwater, agricultural, rangelands, forests (also National Guidelines)

• SANDEE (2009-10): 4+ DUVs – TCM, multiple linear regression models, compensating wage differentials, and a Hedonic property value model

• PIDE (2008): willingness to pay for safe drinking water

The Total Economic Value of Keenjhar

- Fisheries: USD 38.5 m

- Tourism: USD 42.2 m

- Water Supply to Karachi: USD 74.4 m

- Species Protection: USD 4 m

Research Questions

• What are access values associated with recreational visits to Keenjhar? (i.e., what is the estimated mean consumer surplus per visit)

• How do access values change when incidental visits to complementary sites are included in the model?

• How does (the opportunity cost of) time valuation change when assumptions about labour decisions are varied in this model?

• Is an investment in the rigorous measurement of outset origins for visitors using charter transport worthwhile in terms of increased precision in welfare measurement?

Theoretical Model
- Haab and McConnell (2002)

Multiple Purpose Visits
- Parsons and Wilson (1997)

Implications of Labor Decisions on Time Valuation
- Bockstael, Strand and Hanemann (1987)

Outset Origins
- Bateman et al. (1997)
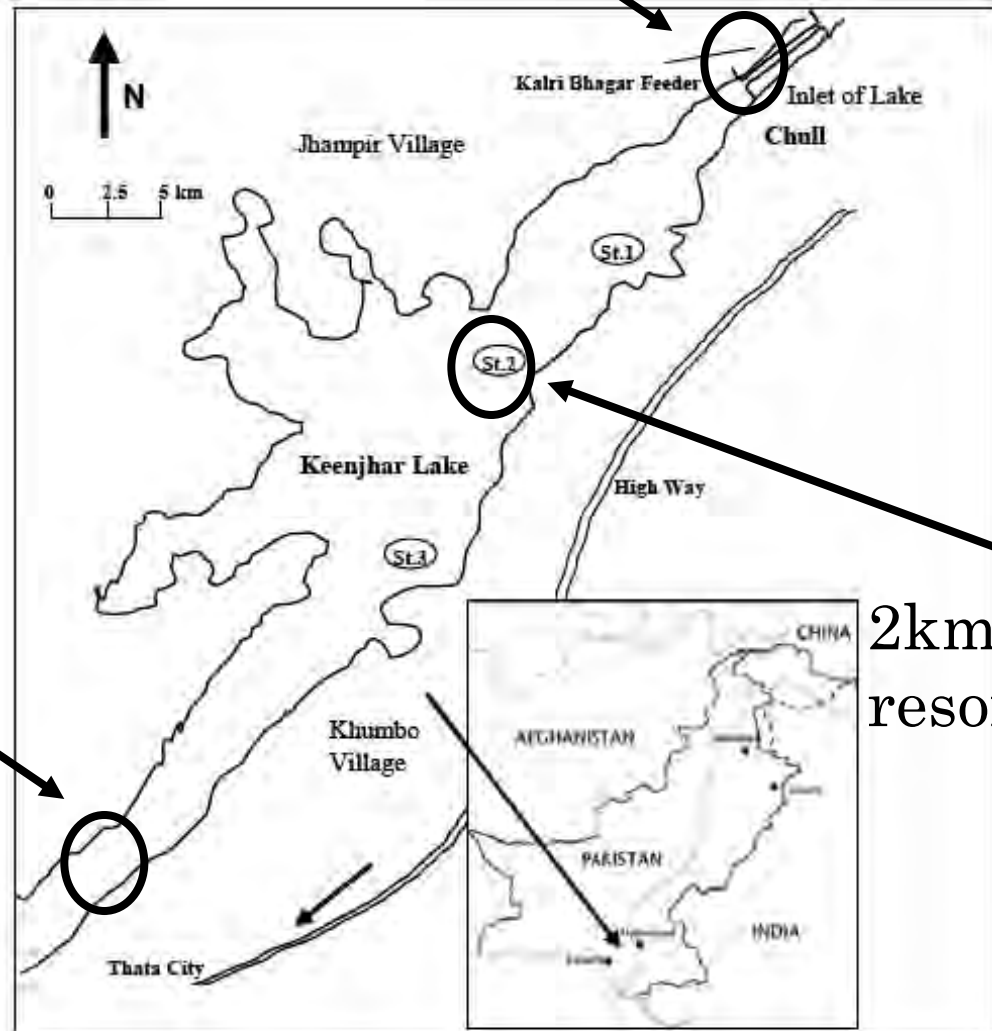- Shammin (1999)
- Mahat and Koirala (2006)

Chull: inlet

Station 2:
Monitoring
Station

Jam:
Outlet

KWSB:
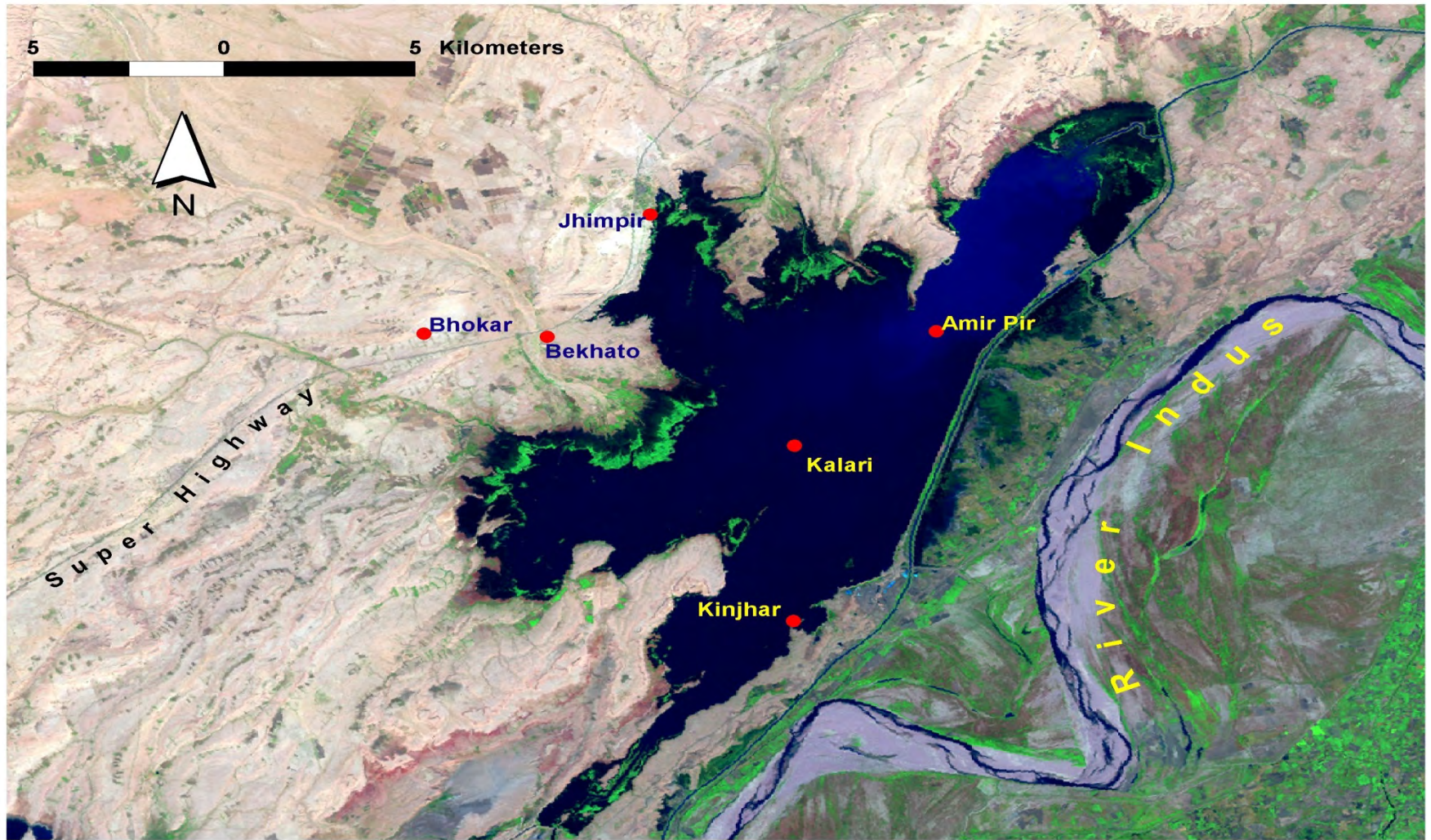regulatory
body

Study Area

2km STDC
resort

Figure 1. The position of three selected stations at Keenjhar Lake.
(St. 1) Sunheri, (St. 2) Helaya, and (St. 3) Khumbo.

Location Map of Kinjhar Lake, Thatta

Map Source: WWF-P, 2006

Basic count model for the TCM:

$$\Pr(x_j = n) = f\left(n, z_j, \beta\right), n = 0, 1, 2, \ldots k$$

General form of access value measurement:

$$WTP\,(access) = \int_{p_i^0}^{p^*} f\left(s, C_2 + w_i t_2, y_i^f\right) ds$$

Welfare measurement in the Poisson Regression Model:

$$WTP\,(access) = \int_{P_i^0}^{\infty} e^{\beta_0 + \beta_1 s} ds$$

$$= \left[\frac{e^{\beta_0 + \beta_1 s}}{\beta_1}\right]_{P_i^0}^{P \to \infty} = -\frac{x}{\beta_1}$$

Modeling structure for labor / leisure choice:

$$\ln \quad x_m^1 = g\left(\ p_m + w\, t_m,\ I + w\, T\ \right) for\ m = j, k, l$$

$$\ln \quad x_m^2 = g\left(\ p_m,\ t_m,\ I, T\ \right) for\ m = j, k, l$$

Sampling and Data

Site-based sample, systematic sampling, and subdivision of site zones into clusters; 1,000 questionnaire sampling plan:

Sampling Plan (Zones A & B): Weighted by zones, days of the week, single day time segments, by activity category & district participation

Zone A & B		Swimming	Rub Tubes	Boats	Play Rides	Jhompris	Cottages	Restaurant	Vendors	Car Wash	Total	Karachi	Thatta	Hyderabad	Other 10 Districts	Total
Sunday	730-1030	74	16	19	0	2	0	0	3	0	115	69	16	12	18	115
	1030-1330	32	7	42	8	4	0	0	11	3	108	65	15	11	17	108
	1330-1630	31	17	17	2	5	0	3	3	2	80	48	11	8	13	80
	1630-1930	29	19	34	5	4	0	16	17	2	126	76	18	13	20	126
Monday	730-1030	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1030-1330	11	6	33	18	1	0	0	2	2	74	44	10	7	12	74
	1330-1630	14	5	11	4	2	0	4	1	1	43	26	6	4	7	43
	1630-1930	5	7	11	1	0	0	1	4	2	31	19	4	3	5	31
Tue	730-1030	0	1	8	5	0	0	0	2	0	16	10	2	2	3	16
	1030-1330	0	0	10	0	0	0	0	6	1	17	10	2	2	3	17
	1330-1630	0	2	0	2	0	0	0	2	1	8	5	1	1	1	8
	1630-1930	0	0	1	0	0	0	0	1	0	2	1	0	0	0	2
Wed	730-1030	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1030-1330	0	4	2	22	1	0	0	0	0	30	18	4	3	5	30
	1330-1630	1	5	20	15	1	0	1	4	1	48	29	7	5	8	48
	1630-1930	1	1	13	0	0	0	1	1	1	18	11	3	2	3	18
Thu	730-1030	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1030-1330	0	2	12	24	1	0	0	6	2	46	27	6	5	7	46
	1330-1630	4	5	27	4	0	0	1	4	1	45	27	6	5	7	45
	1630-1930	0	2	1	2	0	0	0	3	1	9	5	1	1	1	9
Fri	730-1030	2	24	23	18	1	0	0	2	1	70	42	10	7	11	70
	1030-1330	0	2	8	29	2	0	0	1	2	44	27	6	4	7	44
	1330-1630	2	4	18	7	1	0	0	4	1	36	22	5	4	6	36
	1630-1930	0	3	7	18	0	0	1	1	2	33	20	5	3	5	33
Total		207	133	317	185	27	1	30	77	24	1001	601	140	100	160	1001

Reconnaissance Survey:

7-day gate count (28.2.09-6.3.09)
- 392 questionnaires / vehicles; 5,892 individuals

6-day activity survey (29.2.09-6.3.09):
- 158 questionnaires / "groups"; 2,733 individuals (2,428 activity participants).
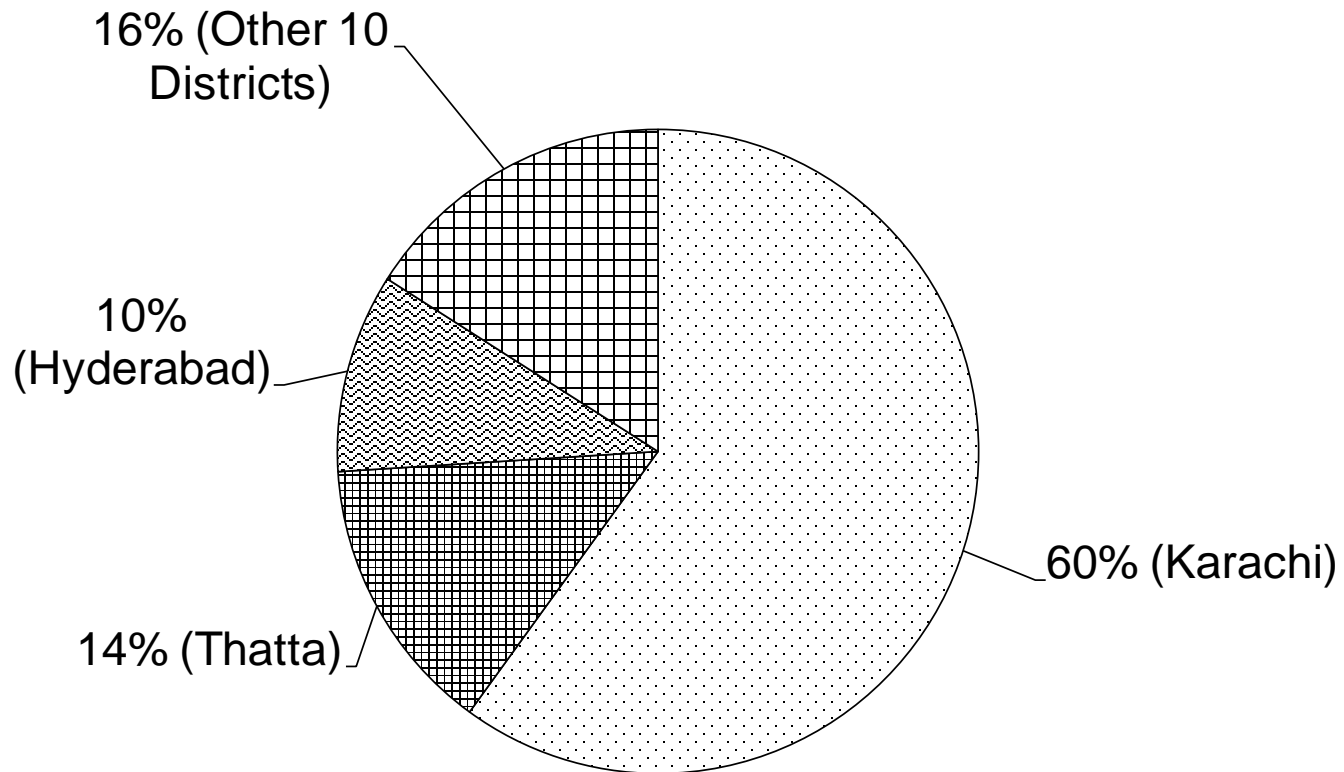
Meetings & secondary data (key informant, district census data)

Identified need for breaking charter transport users into two groups: those collected from their doorstep and those incurring time and out-of-pocket expenses before boarding chartered transport (i.e., rented buses/vans)
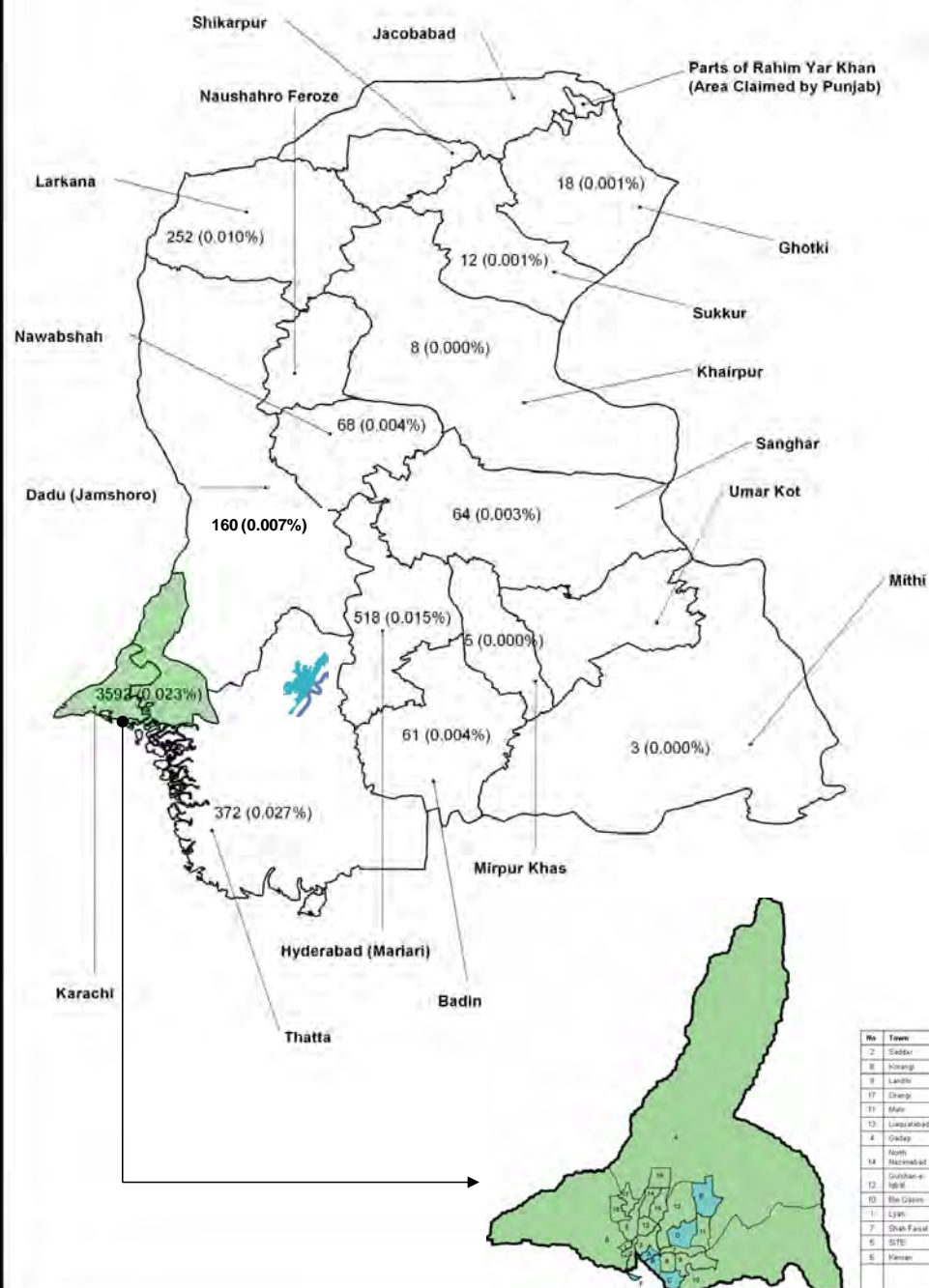
Fig.1: Visitation by District (28.2.09 - 6.3.09)

16% (Other 10 Districts)

10% (Hyderabad)

60% (Karachi)

14% (Thatta)

Keenjhar Lake: No. of Visitors & Visitors Per Capita (28/02/09 - 06/03/09)

Shikarpur

Jacobabad

Naushahro Feroze

Parts of Rahim Yar Khan
(Area Claimed by Punjab)

Larkana

18 (0.001%)

252 (0.010%)

Ghotki

12 (0.001%)

Sukkur

Nawabshah

8 (0.000%)

Khairpur

68 (0.004%)

Sanghar

Dadu (Jamshoro)

Umar Kot

160 (0.007%)

64 (0.003%)

Mithi

518 (0.015%)

5 (0.000%)

3592 (0.023%)

61 (0.004%)

3 (0.000%)

372 (0.027%)

Mirpur Khas

Hyderabad (Mariari)

Karachi

Badin

Thatta

No	Town	Visitors	Vis/Pop
2	Saddar	1694	0.159%
8	Korangi	529	0.069%
9	Landhi	266	0.024%
17	Orangi	246	0.021%
11	Malir	227	0.035%
13	Liaquatabad	163	0.014%
4	Gadap	140	0.039%
14	North Nazimabad	135	0.017%
12	Gulshan-e-Iqbal	116	0.011%
10	Bin Qasim	31	0.006%
1	Lyari	68	0.009%
7	Shah Faisal	39	0.007%
5	SITE	18	0.002%
6	Kemari	9	0.001%
		3592	

Map Source: WWF-Pakistan, 2009

Saddar > 12 other districts

Korangi > Hyderabad district
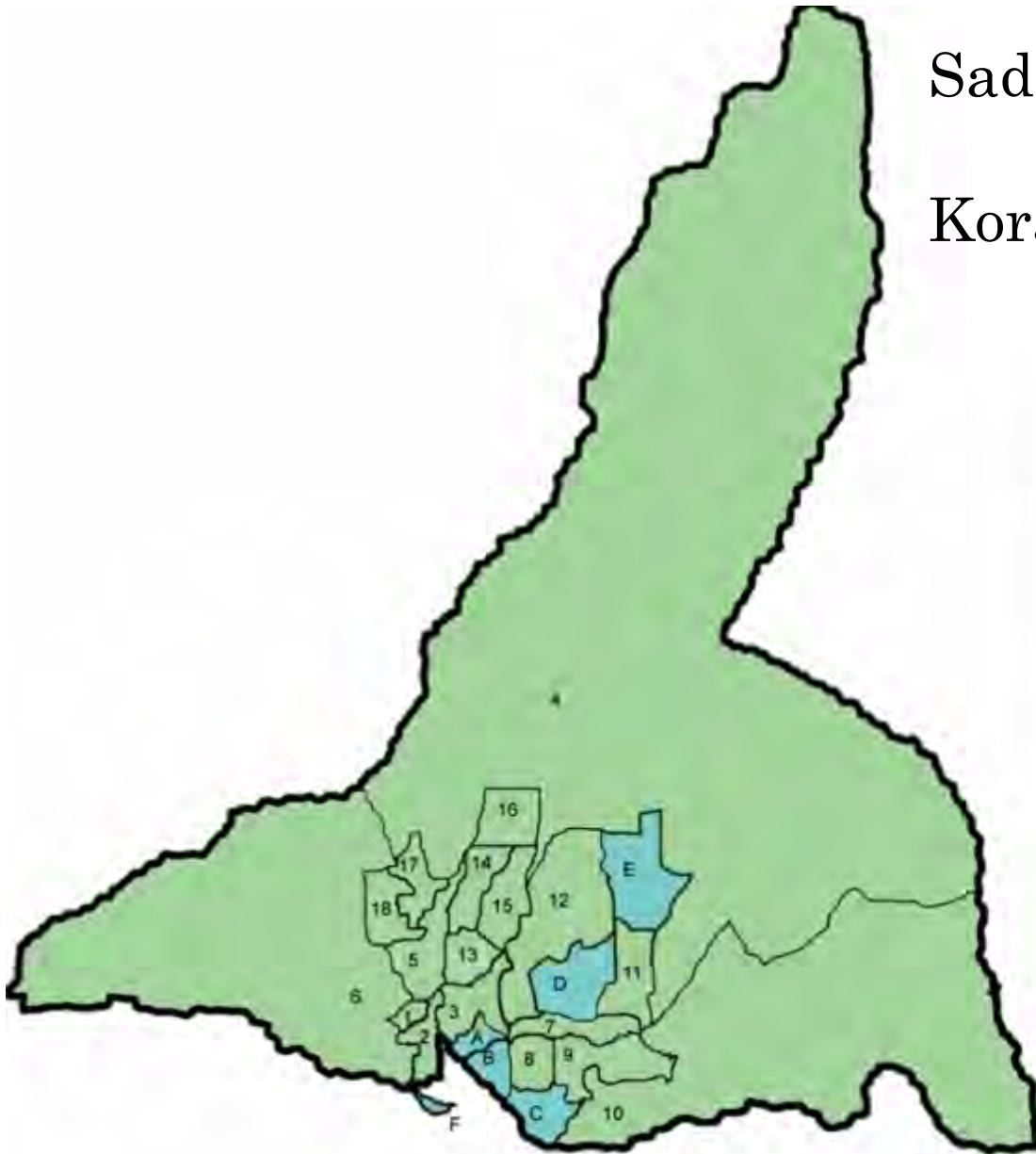
No	Town	Visitors	Vis/Pop
2	Saddar	1594	0.159%
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14	North Nazimabad	135	0.017%
12	Gulshan-e-Iqbal	116	0.011%
10	Bin Qasim	31	0.006%
1	Lyari	89	0.009%
7	Shah Faisal	39	0.007%
5	SITE	18	0.002%
6	Kemari	9	0.001%
		3592	

65% of total respondents

71% of total respondents

Chart 1. Repeat Visit Variation (2008)

Nos. of Vistors (Day Trippers Only)

120
100
80
60
40
20
0

Nos. of Repeat Visits
1 2 3 4 5 10 15 20 25 30
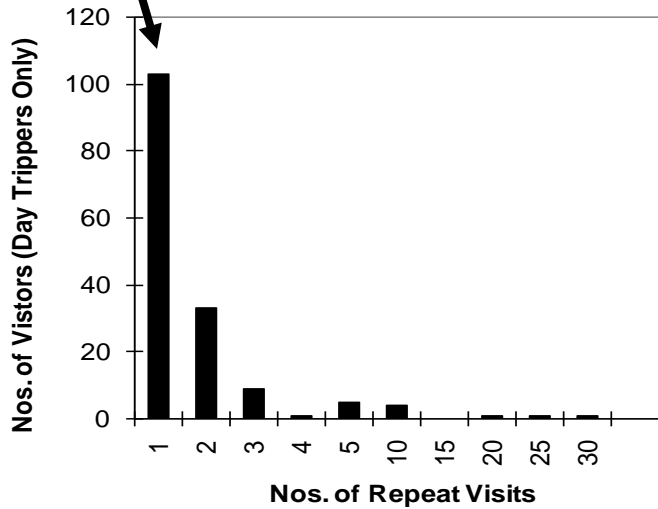
Chart 2: Repeat Visits (2009: Jan-Feb)

Nos. of Vistors (Day Trippers only)

120
100
80
60
40
20
0

Nos. of Repeat Visits
0 1 2 3 4
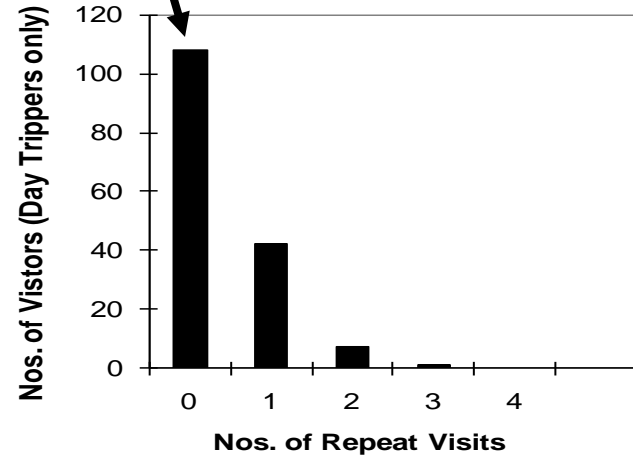
54% of total respondents

51% of total respondents

Chart 4. Repeat Visits (2004-2008 Yr. Avg)
- October -

Nos. of Vistors (Day Trippers only)

Nos. of Repeat Visits
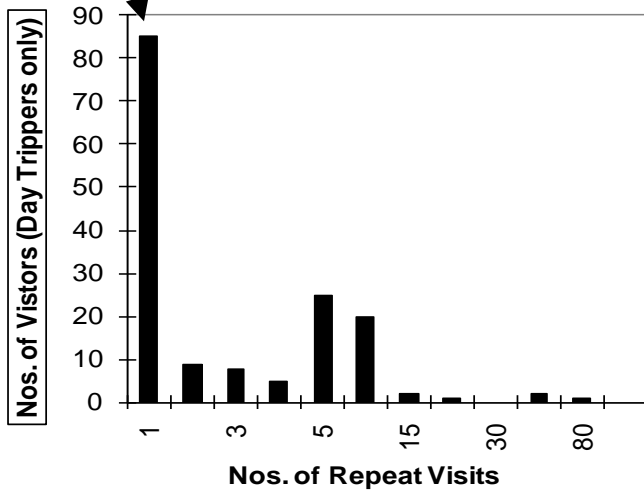
Chart 5. Repeat Visits (2004-2008 Yr. Avg)
- June-July -

Nos. of Vistors (Day Trippers only)

Nos. of Repeat Visits
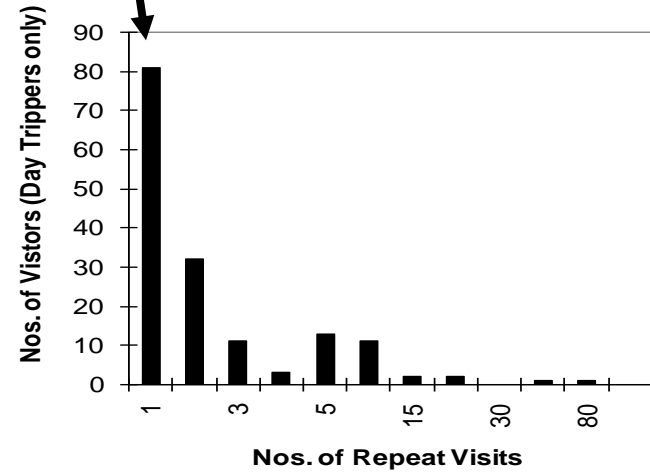
Main survey data (12-18 Aug 09; 741 observations):

- Multiple destination and past visitation trends

- Improvement to site

- Averting behavior and site quality

- Household income and social characteristics

- Visiting party characteristics

- Travel costs (car owners vs. charter transport users)

- Incidental visits, labor / leisure choice, vehicle depreciation

- On-site expenses

Explanatory variables and associated hypotheses:

Variables	+/-	Definition & Hypothesis	Mean	Std. Dev.	Min	Max
Travel Cost (pi1)	-	Out-of-pocket and travel time costs that excludes opportunity cost of time of visitors able to trade available recreation time with work time (H_0: travel cost is inversely related to the number of visits)	1,283	1,162.3	0	1,6078
Travel Time (Ti)	-	Two-way travel time of "constrained" individuals only (H_0: as travel time increases, fewer visits will be undertaken).	174.05	90.83	3	900
Household Income (mon_income)	+	Annual income of households (H_0: an income rise is accompanied by increased visitation).	43,000	74,343.36	2,000	1,000,000
Education (education)	+	Years of schooling of respondents	11.85	3.58	0	21
Age (age)	-	Age in years of respondents (H_0: Age to be inversely related to visits)	31.66	9.97	12	73
Distance (distance)	-	One way distance to Keenjhar	49.57	79.84	28	487

Explanatory variables (Dummies) & associated hypotheses:

Variable	+/-	Hypothesis	Description	Frequency	%	Cum.%
Gender *(gender)*	+	1 if males, 0 otherwise (H_0: males face fewer travel constraints)	Male	732	98.79	98.79
			Female	9	1.21	100
Marital Status *(married)*	-	1 if married, 0 otherwise (H_0: single males face fewer obligations when making a travel decision).	Single	322	43.45	43.45
			Married	419	56.55	100
Residence *(urban)*	-	1 if rural (H_0: rural visitors are less likely to visit)	Rural	114	15.38	15.38
			Urban	627	84.62	100
Water-based Activities *(waterac_pref)*	+	1 if respondent prefers activities that require direct contact with water (e.g., rubber tube rental, wading, or, swimming), 0 otherwise (H_0: visitors with such a preference are likelier to visit the lake)	Yes	676	91.85	91.85
			No	60	8.15	100

Explanatory variables (Dummies) & associated hypotheses:

Multiple Purpose Visits (d_mp)		1 if respondent undertook incidental side trips for other purposes, 0 otherwise (H_0: visitors taking such trips cannot be said to draw consumer surplus wholly from Keenjhar)	Yes	309	41.7	41.7
			No	432	58.3	100
Unemployed (unemp_09)	?	1 if employed in 2009 (H_0: indifferent as regards the expected sign of the variable)	Yes	567	76.52	76.52
			No	174	23.48	100
Increased Entrance Fee (wtp_50)	+	1 if respondents agreed pay to hypothesized increase in entry fee of PKR 50 (H_0: agreeing to pay would enhance visits)	Yes	533	71.93	71.93
			No	208	28.07	100

Estimator selection for the TCM

Poisson Regression Model's probability density function:

$$\mathbf{Pr}(x_i = n) = \frac{e^{-\lambda_i}\lambda_i^n}{n!}, n = 0, 1, 2, \ldots$$

$\lambda_i = \exp(z_i\beta)$ parameter is both mean & variance, statistical tests show this condition to be violated in recreational data

As variance often exceeds the mean in such data, this can be tested by the Negative Binomial whose probability density function is:

$$\mathrm{Pr}(x_i) = \frac{\Gamma\left(x_i + \frac{1}{\alpha}\right)}{\Gamma(x_i + 1)\,\Gamma\left(\frac{1}{\alpha}\right)}\left(\frac{\frac{1}{\alpha}}{\frac{1}{\alpha} + \lambda_i}\right)^{\frac{1}{\alpha}}\left(\frac{\lambda_i}{\frac{1}{\alpha} + \lambda_i}\right)^{x_i}$$

Estimator selection for the TCM

	Endogenous Stratified and Truncated Poisson		Endogenous Stratified Negative Binomial	
	1	2	3	4
Prt	Estimate (S.E.)	Estimate (S.E.)	Estimate (S.E.)	Estimate (S.E.)
Constant	-0.195*** (0.053)	0.373*** (0.065)	-14.347 (196.956)	-12.988 (93.716)
Travel Cost	-0.00005* (0.00003)	-0.00006** (0.00004)	-0.00005 (0.00005)	-0.00005 (0.00005)
Monthly Income	1.09e-08 (5.13e-07)	7.58e-08 (5.09e-07)	-3.62e-08 (7.45e-07)	-8.29e-09 (7.46e-07)
Travel Time		-0.048*** (0.0106)		-0.051*** (0.016)
LR / Wald χ^2	2.41	24.12	1.16	11.84
χ^2	0.2998	0.0000	0.5601	0.0080
Pseudo R^2	0.0010	0.0096		
α			2069827 (4.08e+08)	637830.7 (5.98e+07)

- coefficient signing: as expected in models 1 & 2; negative income signing in models 3 & 4)

- Travel cost coefficient: significant in models 1 & 2, at 1% and 5% levels, respectively)

- No overdispersion: tested null hypothesis of $\alpha = 0$ – not significantly different from zero (t-stat nearly zero and insignificant in models 3 and 4)

Estimation of the 7 variable Poisson model

Prt	1	2	3
	Estimate	Estimate	Estimate
	(S.E.)	(S.E.)	(S.E.)
Constant	-1.192	-1.288*	-1.218*
	(0.728)	(0.729)	(0.729)
Travel Cost	-0.00006**	-0.00007**	-0.0001**
	(0.00003)	(0.00004)	(0.00004)
Travel Time	-0.052***	-0.053***	-0.080***
	(0.011)	(0.011)	(0.015)
Monthly Income	2.17e-07	2.91e-07	3.19e-07
	(5.06e-07)	(5.11e-07)	(5.13e-07)
Gender	1.696**	1.719**	1.783**
	(0.709)	(0.709)	(0.710)
Married	0.231***	-0216***	-0218***
	(0.072)	(0.072)	(0.072)
Urban	0.299***	-0301***	-0304***
	(0.088)	(0.088)	(0.088)
Waterac_pref	0.255*	0.234*	0.220
	(0.139)	(0.139)	(0.139)
D_mp		0.225***	-0.048
		(0.070)	(0.132)
Inacted_Pil			0.00007
			(0.00007)
Inacted_ttime			0.058***
			(0.022)
LR χ^2	58.19	68.5	76.43
χ^2	0.0000	0.0000	0.0000
Pseudo R^2	0.0233	0.0274	0.0306

- coefficient signing: as expected, except for married in model 1

- marginal effects after Poisson (model 3): trips↓ by 0.03 for a 100,000↑ in monthly income

- elasticities after Poisson (model 3): 10%↑ in travel costs would result in a 1.3%↓ in trip frequency

Estimation of the 11 variable Poisson model

Prt	1	2	3
	Estimate (S.E.)	Estimate (S.E.)	Estimate (S.E.)
Constant	-1.299* (0.751)	-1.424* (0.752)	-1.352* (0.753)
Travel Cost	-0.00007** (0.00003)	-0.00007** (0.00004)	-0.0001*** (0.00005)
Travel Time	-0.051*** (0.011)	-0.052*** (0.011)	-0.079*** (0.016)
Monthly Income	1.72e-07 (5.22e-07)	2.31e-07 (5.29e-07)	2.65e-07 (5.32e-07)
Gender	1.699** (0.710)	1.725** (0.711)	1.777** (0.711)
Married	-0.254*** (0.085)	-0.241*** (0.084)	-0.239*** (0.085)
Urban	-0.296*** (0.089)	-0.310*** (0.089)	-0.304*** (0.089)
Waterac_pref	0.254* (0.139)	0.234* (0.139)	0.221 (0.139)
Education	0.004 (0.010)	0.006 (0.010)	0.007 (0.010)
Unemp_09	0.061 (0.089)	0.073 (0.089)	0.050 (0.090)
Wtp_50	0.080 (0.080)	0.083 (0.079)	0.094 (0.080)
Age	-0.0005 (0.004)	-0.0004 (0.004)	-0.0005 (0.004)
D_mp		0.231*** (0.071)	-0.047 (0.133)
Inacted_pil			0.00007 (0.00007)
Inacted_ttime			0.058*** (0.022)
LR χ^2	60.10	71.00	78.95
χ^2	0.0000	0.0000	0.0000
Pseudo R^2	0.0240	0.0284	0.0316

- consumer surplus: 5% smaller than 7 var model; overlooking on-site nature of sample results in a 5% overestimate of the sample mean willingness to pay.

- income coefficients: statistically insignificant

Impact of Outset Origins on Welfare Measurement

Sample used	Outset Origin	TC Coefficient	Standard Error	Z Value	Log Likelihood	Prob > chi2	Consumer Surplus (mean per visit, USD)
47 charter transport users who were not picked from home (6% of the sample)	CPD	-0.0001891	0.0003738	-0.51	-47.231313	0.1205	64
	Home	-0.0002658	0.0003727	-0.71	-47.102377	0.1059	45
Entire sub-sample of 437 charter transport visitors (59% of the sample)	CPD	-0.0002814	0.0001	-2.81	-699.21066	0.0171	43
	Home	-0.0002958	0.0000995	-2.97	-698.74401	0.0107	41
Full sample (741 visitors)*	Home	-0.0001108	0.0000506	-2.19	-1211.2103	0.0000	109
Full sample (741 visitors)**	Home	-0.0001051	0.0000497	-2.11	-1212.4745	0.0000	115

Note: The term "home" indicates that welfare was calculated assuming that all chartered transport visitors were picked from their doorsteps; conversely, welfare measurement incorporating time and out of pocket expenses incurred before boarding chartered transport is denoted by "common point of departure" (CPD).
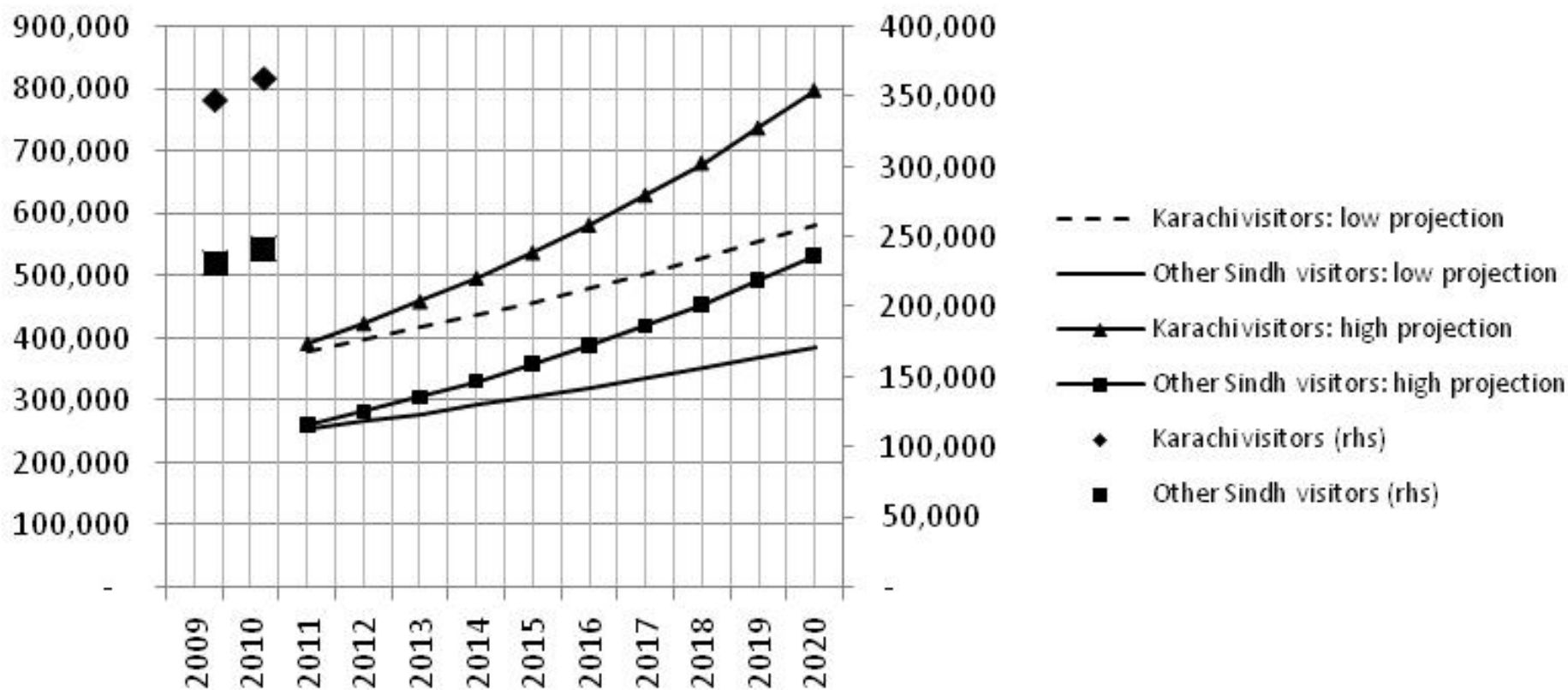* Results relate to model 3 in table 4. ** Results relate to model 3 in table 3.

Cost variable construction: questionnaire design

From home to common point of departure				From common point of departure to Keenjhar			Average cost incurred from common point (excl. other sites visited) *4				
Transport mode *1	Cost of Transport (one-way) (Rs.) *2	Travel Time (one-way) (min.)	Distance (one-way) (Km.)	Total no. of Passengers in vehicle (Estimated no.)	Agreed cost (per head) for transporting all passengers (two-way) (Rs.) *3	Cost to Individual (inclusive of dependents, if any) (Rs.)	Fuel cost (two-way) (Rs.)	Toll fee (Rs.)	Entrance Fee (vehicle) (Rs.)	Entrance fee (individual) (Rs.)	Others (Rs.)
A14ba	A14bb	A14bc	A14bd	A131be	A14bf	A14bg	A14bh	A14bi	A14bj	A14bk	A14bl

*1 Transport mode: [1] taxi; [2] rickshaw; [3] public transport; [4] car; [5] motorcycle; [6] bicycle; [7] on foot; [8] other_____; * 2 Cost of transport: if sharing total costs of group, this refers to individual's cost only (must include cost of covering dependents); *3 Agreed cost for transporting all passengers: this is the full amount that covers all passengers – it must include vehicle rental, toll fee, food, petrol, etc. – in so doing, the figure groups cost items that the tour operator may have offered separately (e.g., petrol is sometimes not covered by tour operator); *4 Items here are a disaggregation of column f (or column g, as the case may be).

Trend in visitor numbers to STDC reserve (2009-2010) and projections (2011-2020)

Legend:
- Karachi visitors: low projection
- Other Sindh visitors: low projection
- Karachi visitors: high projection
- Other Sindh visitors: high projection
- Karachi visitors (rhs)
- Other Sindh visitors (rhs)

Source: Author projections based on Rana 2009 and SANDEE surveys (28 Feb – 6 Mar 09 and 12-18 Aug 09);
STDC records (revenue statistics and visitation logbooks) inaccessible.

Credibility – Receptiveness

- Institutional and Legal Framework (e.g., UK's DEFRA's sanctioning of particular valuation techniques; EU Directives to be supported by CBAs inclusive of EIAs; US environmental damage cases require monetization under law; Australia's Regulatory Impact Assessment process requires CBAs with State and Federal level mandating)

- National Guidelines (e.g., EU's EUROFOREX, Pakistan's FAO and MoE guidelines) help with heightened consistency and quality in adherent reports, an evolving database of values and benefits transfer protocols, and, identification of issues and challenges for future research & within sectors

- Capacity Building (environment, economic and resource ministries' line officials who commission & oversee studies)

Credibility – Receptiveness cont.

- National Steering and Peer Review Committees (e.g., technical advisory group for forest valuations in Pakistan; membership to reflect inter-ministry cooperation, aside from expertise and civil society participation)

- Valuation linked to CBAs, budgetary allocation and natural capital depreciation tracking processes

- Overhaul planning and decision making processes (besides addressing anachronisms and perverse incentive structures, to create a race to the top vis-à-vis institutional culture and its demand for transparency, best practices, natural capital stock depreciation tracking, etc.)

Credibility – National Guidelines

- Sector specific guidelines (e.g., forest sector)

- Technique appropriateness specific to sectors

- Evolving databases of study results, questionnaires, etc.

- Detailed protocols on sampling, questionnaire design, analytical boundaries (ranking of services, annotations on importance of each), reconnaissance surveys, log file records

- Model specification: practical issues treated penetratingly (e.g., citing appropriate empirical modeling guidebooks)

- Pedagogical content: Excel, CSPRO, STATA, etc.

Credibility – Best Practices in Study Conduct

Standards developed for:

- necessity
- objectives
- identification assets, services, attributes, peculiarities
- identification of physical and analytical boundaries
- selection of models within technique
- questionnaire design
- database management
- calibration and model specification
- overall TEV computation model
- reconnaissance surveys
- sampling strategy
- interpretation of results (present as interval estimators, use of sensitivity analysis, justify NPV and discount rate choice, policy analysis to emphasize trade-offs)

Policy Relevance – TEEB (2010) Evaluation

	Steps for Including Ecosystem Services in National Policy (6 Steps)	Strategies and Tools	Assumptions
Source: elaborated from "A Quick Guide to the Economics of Ecosystems and Biodiversity for Local and Regional Policy Makers" TEEB (2010)	• Specify and agree on the policy issue with stakeholders • Identify which services are most relevant • Oversee information needs and selection of appropriate methods • Have ecosystem services assessed • Identify and appraise policy options • Oversee assessment of distributional impacts according to dependency	• Stakeholder analysis and policy appraisal / management frameworks • Centrality, dependence, services at risk, sensitivity to policies identified • Qualitative, biophysical and monetary informational needs identified • Application of TEVs, benefits transfer / supporting manuals, databases used • Feeds into policy via public debate, basis for CBA, basis for increased allocations • Poverty / livelihoods assessment tools	• Environment, resource and economic ministries coordinate, receptiveness to previous cross-sector environmental mainstreaming • Availability of expertise (consultants and capacity among those overseeing) & financial resources (c. PKR 5-8 m per ecosystem) to complete DUV / IUV / NUV assessment of multiple & commercially important service provision ecosystems • Prior preparation and sanctioning by national steering / peer review committees of guidelines, manuals, legislation, evolving databases, etc. • Existing awareness and venues for public debate, routine natural capital stock depreciation tracking & usage of CBA to determine and justify allocations • Targets for self-sufficiency of ecotourism enterprises & FDI targets do not trump distributional impacts

Policy Relevance – TEEB (2010) Evaluation Cont.

TEEB (2010): Performance Framework Applied to a Freshwater Ecosystem in Pakistan

DUVs (fisheries, recreational use) + IUVs (commercial/domestic water supply to Karachi) + NUVs (species protection)

How		Who	What		Why
How should the expected results be achieved?		Who will the project work for and with?	What specific, measurable results are expected to be achieved?		Why do this project?
Resources	Activities	Beneficiaries	Outputs	Outcomes	Impact
Rs. 4 m	Policy issue agreed, priorities established, end uses of report agreed One representative ecosystem selected / representative attributes comprehensively covered; benefits transfer foreseen for Pakistan's other lakes Reconnaissance survey(s) conducted Sampling strategy devised, applied Main survey(s) and data entry completed	Federal: State Bank of Pakistan, Ministry of Finance, Federal Board of Revenue, federal divisible pool committees Provincial: Planning and Development Department, Irrigation Department, Wildlife Department, Ecosystem Steering Committee, universities District: District Coordination Officers, local NGOs, CBOs, Friends of the Indus Forum, Sindh Tourism Development Corporation	1-6 guidance notes on ecosystem services dependency, service flow levels, secondary and primary data requirements, sampling 1 evolving database in STATA -12 format for reuse by planners, decision makers, concerned university students, and federal / provincial / district line officials 1 set of national guidelines on freshwater ecosystem valuation	100 line staff in resource, environment and economic ministries trained using guidance notes, datasets, and national guidelines 5 universities commissioned to complete studies covering remaining 5-10 lake types using datasets 1 state of environment report (Statistics Division, Fed Bureau of Statistics agree raw agree variables, raw data series for these, periodicity)	Improved human resource base for conducting own studies as well as overseeing and commissioning them based on credible standard setting documents Use of higher level indicators to monitor depreciation of freshwater lakes (based on raw data series used to compile variables for indicator calibration)
Rs. 4 m	Analysis of fisheries DUV using "market value" method Analysis of recreational use DUV using "Travel Cost Method" Analysis of water supply IUV using price elasticity of demand & NUV using "choice experiment"	16 m residents of Karachi (80% of water supply from 1 lake), besides 30 m residents from all other districts in Sindh reliant on commercial / domestic / agricultural water supply, recreational use, local villagers who are employed as vendors, future generations from biodiversity conservation	3-5 policy briefs demonstrating priority trade offs among competing uses of lakes 4 studies justifying increased environment sector allocation (specifically to cover depreciation spending needed for freshwater lakes)	CBA s conducted for alternative uses of lake, determining required subsidy, if any, for tourism operations Earmarking of provincial spending to restore and rehabilitate lakes Increased frequency of informed policy debate	Central bank, revenue board, economic ministries, natural resource ministries coordinate to influence gross savings rate, curb GDP consumption and allocate more on environment sectors (freshwater lake conservation)