

#### **Section IV: Forest Valuation Guidelines**

- 7.1 This set of forest valuation guidelines is the product of deliberations among the World Wide Fund for Nature – Pakistan (WWF-P), the Ministry of Environment, Government of Pakistan, the National Forest Programme (NFP) Facility, funded by the Food and Agriculture Organization of the United Nations (FAO), participants in a national consultative workshop who also commented on early drafts of the report posted on WWF-P’s website, a Technical Support Group which includes members from the forest departments of Balochistan, Sindh and NWFP (from among those invited to date) as well as peer reviewers in the form of national and international development practitioners and environmental economists with valuation experience.
- 7.2 The guidelines are also the product of Focus Group Discussions (FGDs) with communities dependent on each of Pakistan’s forest types. The FGDs were conducted by WWF-P experts with considerable expertise in forestry and economic valuation. The survey instrument used for the exercise contained modules on: (a) direct use values (including wood products and non-timber forest products (NTFPs), and respondent participation in data collection); (b) indirect use values (including users’ perceptions as they apply to the design of ecosystem rank tables prioritizing components/assets, functions services, and diversity/attributes for each forest type); (c) shadow pricing; and, (d) a general module covering the sub-community which respondents belonged to and more in-depth questioning about prices, measurements, and context-specific behaviors. (The survey instrument is attached in Annex II of the present document).
- 7.3 Finally, the guidelines are based upon discussions with Key Informants (KIs). One such discussion stands out in particular. In the course of field work conducted between 26.9.09 – 5.10.09 covering 6 forest types between the Margalla Hills National Park, Muree, Dongagali, Kaghan and Naran, the same WWF-P staff participated at the “National Conference on the Promotion of Sustainable Tourism in Kaghan Valley” Naran, on 1-2 October 2009, organized by the Tourism Promotion Association of Kaghan Valley (T-Pak) in collaboration with the Washington DC-based Citizens Network for Foreign Affairs Incorporation (CNFA), Improving Livelihood and Enterprise Development (I-Led), Adventure Foundation Pakistan, the Sarhad Tourism Corporation (STC), and the United States Agency for International Development (USAID). This was an opportunity to interview KIs such as the Conservator Forests Abbottabad Circle; the National Project Manager, Programme for Mountain Areas Conservation (PMAC), Ministry of Environment, Government of Pakistan; the Programme Manager Regional Programmes of the Pakistan Wetlands Programme (PWP), and Project Manager of I-Led.
- 7.4 Accompanying the guidelines and contained in separate sections of the guidelines document are: (1) Section I: a literature review of existing national and international systems of valuation

of forest products and services (its first draft was uploaded for comments at <http://www.wwf-pak.org/wwf-projects/valuation.php> on 23.9.09 and covers a definition of “economic valuation” and asks why it is necessary to derive monetary values, draws out of lessons and procedures relevant to Pakistan, and reviews Pakistan’s store of existing valuation studies including in the forest sector); (2) Section II: an evaluation of present approaches and methodologies of translating forest products and services in monetary terms for typical forest ecosystems of Pakistan (its first draft was uploaded for comments at <http://www.wwf-pak.org/wwf-projects/valuation.php> also on 23.9.09 and covers which valuation techniques are most suitable for the different forest types of Pakistan, a taxonomy of techniques highlighting those with a prior low relevance to Pakistan, and evaluation of direct, indirect, option, existence and bequest value techniques for 10 forest types using 6 criteria); (3) Section III: an identification of products and services of different forest types and existing status of marketing and utilization of forest products and services of Pakistan (covers ecosystem rank tables all forest types prioritizing components/assets, functions services, and diversity/attributes; and, it assesses current and historic trends in production, average unit prices, and trade of NTFPs, timber and firewood, among others); and, finally, (4) Annex I: proceedings of a national consultative workshop organized to lend ownership to the national guidelines.

7.5 The guidelines that follow are organized in the following way: (a) forest valuation objective definition (this will review the different aims or objectives for which valuation studies are commissioned); (b) identification of the peculiarities of the system (geographic, biophysical, economic) (this is based on FGD and KI meetings and comments, where relevant, on biophysical changes in availability over time of natural resources associated with the different forest types) (c) definition of the geographic and analytical boundaries of the ecosystem; (d) identification, sampling and profiling of households in this context (setting of baseline data including that needed for sampling strategies); (e) identification of the forests’ components / assets, functions/services and diversity/attributes (this too this is based on FGD and KI meetings); (f) data requirements by technique and forest type; (g) consensus on choice of models/techniques by forest type; (h) questionnaire design; (i) model specification for revealed and stated preference techniques; (j) accuracy, necessity and sufficiency when examining overall TEV computation; (k) **defining and carrying out sampling strategies**; (l) collection of missing primary data and collection of secondary data; (m) analysis and presentation of results; and (n) interpretation of results.

7.6 **Forest Valuation Objective Definition:** why commission a valuation study? Economic planners and policy makers commissioning TEV studies of the forestry sector often have the following aims and objectives:

- Determine if depleting or degrading environmental resources is more worthwhile, e.g., when deciding to invest in conserving forest land or instead dedicating the same land to development;
- Provide necessary information to accompany poverty-environment studies aiming to refine on the ground interventions where local communities depend upon forest products and services;

- Assess the worth of overall sectoral expenditures, albeit as a single criterion in a package that may include distributional concerns, human health, etc.;
- Assist in making choices between and resolving conflicts among alternative projects (including when developmental and forest conservation projects are pitted against each other);
- Prioritize a constituent parts of a single forest management project to maximize net benefits;
- Determine the order of magnitude or scale of compensation to be granted in a forest land Payment for Environmental Services (PES) feasibility / plan / scheme;
- Determine while assessing prioritization of issues, how important a given issue is (e.g., how important is the loss of timber, resin, mazri, and ephedra output due to partial or whole destruction of a forested area? Forests of course provide other functions, and other important issues can include shelter provided by mangroves to cultivated land, livestock, and agricultural capital located along the coast when cyclones / storms strike, or, prevention of landslides by sub-alpine forest types);
- Develop a strong case for lobbying for the conservation of forests based on accurate and sound economic values;
- Document the different ecological functions of different forest types;
- Re-evaluate available forest data with a view to filling in gaps where necessary; and,
- Estimate by how much to modify national income accounts to reflect the cost of a “draw down” on forest stocks and flows.

7.7 It is important to note that a TEV study result measures the change in “human” wellbeing arising from the provision of a good or service. In as much as it is, in this sense an anthropocentric value, not an intrinsic value of wilderness, it serves its purpose of remaining commensurate with and comparable with monetary units used to measure developmental values.

7.8 Further, the result of a forest valuation study is instrumental in that it is applied in decision-making. It may be considered as a single informational input among many, albeit an important one, when deciding whether to allocate land to development or to wilderness. In effect, in the absence of a TEV study result, decisions concerning the allocation of land will suffer in that they will be made *without* consideration of: (i) true consumptive use values, (ii) contributions to essential / beneficial natural ecological functions, and, (iii) payments people are prepared to give through wildlife and other charities to preserve the existence of environmental assets.

7.9 **Identification of the Peculiarities of Forest Types:** It is helpful for those commissioned to carry out TEV studies in the forest sector to be aware of geographic, biophysical, and other peculiarities associated with each forest type. Guidelines in this regard will assist standard valuation survey instrument design stages: (a) formulating the valuation problem (what is the policy change being valued? How to construct the hypothetical scenario for Contingent Valuation and Choice Experiment methods?); (b) additional questions (attitudes, opinions, knowledge and uses? Demographics? Questionnaire structure); and, (c) pilot testing of questionnaire (verbal protocols; sampling plan; field pilots). These stages are covered in sections 7.10 – 7.22 below.

7.10 Standard valuation survey design stages and peculiarities of Pakistan’s forest types: First, we examine the question of formulating the valuation problem. In this regard, the “policy change

being valued” common to all forest types is damage caused by increased abstractions of timber, firewood and non-timber forest products (NTFPs). In relation to timber, firewood and NTFPs, paragraphs 7.11 to 7.13 (below) provide factual information and discussion covering forest types, geographic locations, and biophysical peculiarities in order to assist the framing of the question of which policy changes are to be valued.

- 7.11 Among the different forest types (forest types are numbered following Tables 2-11 in section 4 of the present guidelines), four in particular, namely subtropical chir-pine [5], Himalayan moist temperate [6], and Himalayan dry temperate and juniper / chilghoza types [7 & 10], roughly accounting for 40% of Pakistan’s total forest area (concentrated in Azad Kashmir, NWFP and Northern Areas), comprise softwood resources that are the main source of construction timber in the country. Hardwood is obtained mainly from Sindh and Punjab and is destined for manufacture of furniture, sports goods, matchsticks, pit props and plywood, among others. Owing to the dominant value added share of sports goods in total exports of wood-based products, hardwood may be of interest to those undertaking valuations incorporating international trade or shadow pricing<sup>1</sup> in their analysis. Coniferous wood is concentrated in Azad Kashmir, NWFP and Northern Areas and is mainly used for construction purposes. Mining timber, for its part, is principally obtained from riverine forests.
- 7.12 Although all forest types [1-10] provide firewood to some extent, local populations relying on sub-alpine [8], alpine scrub [9] and mangrove forest [1] types may be easily observed by researchers wishing to document the simultaneous abstraction of fuel wood and resources for grazing of animals. In the commercial sector, brick kiln, tobacco curing and charcoal are major users of firewood. Hardwood is preferred as fuel for cooking and heating purposes.
- 7.13 NTFP products with highest commercial values include resin, mazri, and ephedra. Resin is obtained from the subtropical chir-pine [5] forest types located in NWFP, Azad Kashmir and Punjab. Leaves of the mazri dwarf palm are used to manufacture ropes, baskets, and hand fans,

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<sup>1</sup> The term “shadow pricing” refers to the adjustment of direct transfer payments, price distortions in traded and non-traded items, and foreign exchange premiums. As concerns direct transfers, accounting procedures must exclude direct taxes, subsidies, loans, receipts, and principal and interest repayments. As concerns wood or NTFP trade, border prices should be adjusted for domestic transport and marketing costs between the farm gate (e.g., “lot” at an auction conducted by the Nawabshah Afforestation Division) and the border. For import of timber there may be a need to adjust the cost, insurance freight price (c.i.f. price) while for exports the free on board (f.o.b.) border price would be used. As concerns non-traded items, low seasons associated with surplus labour were recorded by this study’s survey instrument – this will help determine when not to use rural wages to value agricultural labour, noting that the marginal value product of the additional worker is below the going wage rate in these low seasons. As regards foreign exchange premiums, these include quotas or bans on certain types of wood and over/under valued exchange rates causing people to pay premiums for traded goods above/below that for non-traded goods. For details on deriving shadow foreign exchange rates see EEPSEA (1997), Section C, sub-section 1.2.

among others. Mazri is produced mainly in Balochistan and NWFP. A commercial drug known as Ephedrine used to treat Asthma relies on ephedra abstraction.

- 7.14 We now turn to guidelines on how to construct a hypothetical scenario, as stated in section 7.9 (a) above. This sub-section encourages use of existing draft guidelines on best-practices (see literature reviewed in section 3 of the present guidelines) and delves solely into aspects that are significant for on-the-ground application in the Pakistan context. As regards existing best-practice guidelines, we recommend consultation of the US Federal Register of 15 January 1993 for the Contingent Valuation (CV) method. For the Hedonic Pricing, CV, Travel Cost, and Choice Experiment (CE) methods, guidelines specifically for the forest sector can be found at <http://www.medforex.net/e45/meeting.htm#6thmeet> (EUROFOREX guidelines).
- 7.15 Once the policy change of interest has been identified, researchers can start to put together a hypothetical scenario to be shown to respondents – such scenarios are relevant for a CV or CE survey instrument. Experience with preparing a CE survey for administration in Karachi (WWF, 2008), covering an irrigated plantation in Nawabshah, among other ecosystems, reveals several lessons for construction of a hypothetical scenario<sup>2</sup>. First, photographs depicting valuable species, a simple but appealing map on all choice panels, and careful training of enumerators proved to be essential. The pictures and map captured the respondent’s attention with the need to carefully review numbers in each of the three scenarios presented on each of the 8 choice panels. Enumerators were trained and hence able to answer questions about WWF’s planned / ongoing interventions at Nawabshah. As regards the payment vehicle, WWF’s good reputation as a not-for-profit organization in Karachi allowed the credible use of Willingness to Pay (WTP) questions that took the form of a one-off donation payable in installments. Credibility is a major issue in Pakistan as are liquidity constraints. Payment in installments took care of the issue of liquidity constraints. Besides WWF’s credibility, collection on a door-to-door basis is possible in urban centres of Pakistan owing to the fact that utility and home subscription services are paid for routinely in this manner. WWF’s expertise and existing 50-year Indus Ecoregion logframe (which includes realistic objectively verifiable indicators and means of verification), it was possible to establish accurate target and reference payment levels in relation to the forest in Nawabshah. This last point is non-trivial, since few interventions in Pakistan’s forests rely on resource-intensive comprehensive baselines and scientifically established species population figures, among others.
- 7.16 We finish this sub-section of the guidelines with what has already been said about hypothetical scenario construction. Other aspects of CV and CE design are standard and covered in the literature mentioned in 7.14 above. That is, such aspects as debriefing and follow up questions,

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2 See also Dehlavi A., Groom B., Naseem Khan B. and A. Shahab. 2010. “Non-use Values of Ecosystems Dependent on the Indus River, Pakistan: A Spatially Explicit, Multi-ecosystem Choice Experiment”, Chapter 8 in Bennett J. and E. Birol (Eds.) “Choice Experiments in Developing Countries: Implementation, Challenges, and Policy Implications”, Edward Elgar, Washington D.C., USA.

randomized card sorting structure, single vs. double-bounded dichotomous choice formats, bidding games, description of method of payment and constructed market, are standard to CV and CE and ultimately depend non-controversially on the actual goods being studied and the context in which it is being provided. It may be reiterated here that recreational use of forests, of all types [1-10], is best captured by the Travel Cost Method (TCM).

- 7.17 As part of standard stages of designing a valuation survey instrument design, we next examine additional questions (i.e., attitudes, opinions, knowledge and uses; demographics; and questionnaire structure), as stated in section 7.9 (b) above. In all techniques, whether they are based on actual or potential behavior (see “table 1: taxonomy of valuation techniques” in section 4.9), qualitative and quantitative information from attitudinal questions is helpful for validating information directly or indirectly solicited through questionnaire modules containing WTP questions. Often, these variables are good predictors of WTP. These questions are typically placed at the start of the questionnaire to “warm up” respondents, generate involvement, and reduce the chances of non-responses owing to such abrupt questions as what is your household income and WTP?
- 7.18 As regards demographics, questionnaires always contain a module on socioeconomic and demographic characteristics such as age, education and income. With Himalayan moist temperate [6], and Himalayan dry temperate and juniper / chilghoza types [7 & 10] it is noteworthy that respondents are nomadic, yet having a more permanent and sometimes a few permanent addresses. This should be handled with caution, asking the time periods spent travelling and those spent settled at the different permanent address(es). Caution is also necessary to enable follow-up interviews at a later date in such cases as well as to enable supervisors to verify that the interview did in fact take place. Photographs are recommended besides geographical position system (GPS) recordings. In the course of FGDs conducted for the purpose of this survey, it was further found useful to request respondents to identify their “baradari” or single name of the kinship ties of the individual based on familial and ethnic lines. Heads of household are also typically away for up to periods of several months working in nearby urban centres. Questionnaire design should incorporate questions capturing this behavior. One off trips numbering several days are sometimes conducted principally for the sale of NTFPs (e.g., Tavi Phool sold for medicinal purposes in Saidpur by inhabitants of Gokina Khurd, Margalla Hills National Park area – representative of the sub-tropical broad-leaved evergreen forest type [4]). It is preferable to speak to the male head of household. According to FGD and KI meetings, they have greater awareness in terms of time and monetary expenditures, savings (e.g., book keeping accompanying productive activities), and details of vehicle rental to transport large amounts of fuel wood as is common in winter times with coniferous forests at elevations of 1,500-3,000 meters (Himalayan moist temperate [6], and Himalayan dry temperate and juniper / chilghoza types [7 & 10]).
- 7.19 Another important point belying demographic modules in questionnaire design is the ubiquitous reliance on non-natural resource based livelihood strategies such as migration, labour, small businesses, etc. This contradicts the popular assumption that local communities settled in

forested areas are dependent on forest for their cash income. Instead, there is subsistence (or non-cash) dependence on wood for house construction / repair and, principally, fuel wood for cooking and heating. Questionnaires should prompt respondents on cash and non-cash dependencies and strategies in this regard. Note should be made that daily food items and groceries are often purchased from shopkeepers on credit and paid back at the beginning of each month, while relatives and friends are also important sources of loans.

- 7.20 As regards questionnaire structure, let us focus on Travel Cost Method (TCM)<sup>3</sup> and Choice Experiment (CE) survey instruments as these are likely to become the most frequently applied techniques for forest valuations in Pakistan. The latter is readily applied to any context / setting, while the former is highly suited to covering recreational use values within DUVs. As regards TCM questionnaires, structure should broadly cover three modules: (1) household characteristics; (2) site quality; and, (3) choice of on-site activity. As regards 3, we note that activities of day visitors in Pakistan's forests typically include short walks, hiking, picnicking, mushroom picking, bird watching, hunting, and just resting. As regards 1, as the purpose of a TCM model is to regress visitation (dependent variable) on determinants of recreational demand (explanatory variables), inclusion of question relating to club membership (e.g., Adventure Foundation Pakistan) with the purpose of generating a valuable explanatory variable is encouraged.
- 7.21 As regards CE questionnaires, their structure must cover: (1) a choice set (i.e., a set of policy options, composed typically of 3 or more "alternatives"); (2) alternatives (i.e., a particular policy option, composed typically of a low number of "attributes", unless the survey is being administered by post); (3) attributes (i.e., a characteristic of a policy option); and, (4) levels (i.e., the magnitude of a characteristic). This structure is illustrated in tables 18.1 and 18.2 (below) taken from Holmes and Boyle (2003)<sup>4</sup>. In particular, table 18.1 lists "attributes" and their "levels" for timber harvesting practices for forests in Maine. Columns in table 18.2 entitled "Plan A", "Plan B", "Plan C", and "Plan D" each represent a single alternative composed of attributes. Note that the number of "attributes" is 8, namely: roads; dead or dying trees; live trees standing after harvesting; the maximum size of harvest openings; per cent of forest land for timber harvesting; watershed protection; slash disposal; and, purchase of forest land via a one-off increase in 1997 state household income tax by varying USD levels. This is too large a number of attributes for an on-site survey and suitable only for a mail survey in which the respondent can give a high proportion of time to provide considered responses (mail surveys in Pakistan remain

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3 The questionnaire accompanying a TCM valuation of a Pakistani forest reserve / national park, namely Himayatullah Khan (2004), "Demand for Eco-tourism: Estimating Recreational Benefits from the Margalla Hills National Park in Northern Pakistan", SANDEE working paper no. 5-04, can be downloaded from the website of the South Asian Network for Development and Environmental Economics (SANDEE): [http://www.sandeeonline.org/uploads/general\\_docs/questionnaire/demand\\_for\\_ecotourism.pdf](http://www.sandeeonline.org/uploads/general_docs/questionnaire/demand_for_ecotourism.pdf)

4 See Holmes, T. P. and K. J. Boyle. 2003. "Stated Preference Methods for Valuation of Forest Attributes" in Sills, E. O. & Abt, K. L. (eds.) "Forests in a Market Economy". Dordrecht.

to be tested for their effectiveness). The number of “alternatives” is 4 (plans A-D) as can be seen in table 18.2 and would be presented as such in a single “panel”, inviting the respondent to bid either USD 400, USD 60, USD 140, or, USD 10. In this case, the panel shown in table 18.2 does not contain a status quo alternative.

**Table 18.1.** Forest management attributes, levels, and names

Attributes	Levels	Variable Names
Forest road density	One road every mile	ROADS-I
	<b>One road every ½ mile</b>	ROADS-%
Live trees after harvest	No trees > 6-in. diam./ acre	LIVE-O
	<b>153 trees &gt; 6-in. diam./ acre</b>	LIVE-1 53
	459 trees > 6-in. diam./ acre	LIVE-459
Dead trees after harvest	<b>Remove all</b>	DEAD-O
	5 trees/acre	DEAD-S
	<b>10 trees/acre</b>	DEAD-I 0
Max. size of harvest area	5 acres	HAREA_5
	<b>35 acres</b>	HAREA_35
	125 acres	HAREA_125
Available for harvesting	80%	HVST_80
	50%	HVST_50
	20%	HVST_20
Width of riparian buffers	500 ft. min.	H2O_500
	<b>250 ft. min.</b>	I-120-250
Slash disposal	Leave it where it falls	SLASH-LV
	Distribute along skid trails	SLASH-DST
	<b>Remove all</b>	SLASH NO

The management practices representing base level (most common) are shown in bold.

Source: Holmes and Boyle (2003).

**Table 18.2.** Sample forest management plans for the choice and ranking experiments

Attributes	Plan A	Plan B	Plan C	Plan D
Forest road density	1 every ½ mile	1 every mile	1 every mile	1 every ½ mile
Dead trees after harvest	5 trees/acre	5 trees/acre	Remove all	<b>10 trees/acre</b>
Live trees <b>after</b> harvest	459 trees/acre	153 trees/acre	459 trees/acre	No trees
Maximum size harvest opening	125 acres	125 acres	35 acres	5 acres
Proportion <b>cut/</b> set-aside	<b>20% cut/</b> 80% set-aside	<b>50% cut/</b> 50% set-aside	<b>50% cut/</b> 50% set-aside	<b>20% cut/</b> 80% set-aside
Watershed protection	At least 250-A. buffer zone	At least <b>500-ft.</b> buffer zone	At least 250-A. buffer zone	At least <b>500-ft.</b> buffer zone
Slash disposal	Distribute along skid trails	Remove all	Leave it where it falls	Remove all
One-time tax increase	\$400	\$60	\$140	\$10

Source: Holmes and Boyle (2003).

- 7.22 We now turn to the subject of pilot testing of the questionnaire, as per section 7.9 (above). This is essential and is repeated several times in good studies, thereby nearly providing all the answers which are merely confirmed by the main survey. The cost of the main survey consequently occupies a far smaller proportion of project expenses as compared to reconnaissance and pilot tests. The reconnaissance and pilot tests (as well as focus group and key informant surveys) are essential for the following in the administration and set-up of a CE: (a) selection of attributes (e.g., “forest road density” in table 18.1 above); (b) assignment of levels (e.g., “one road every mile” and “one road every half mile”, corresponding to “forest road density” in table 18.1 above; also, if poorly specified, the amount of the bid can cause the entire experiment to fail – correct specification will depend crucially on prior household characteristic information available about the respondent population, e.g., in the Maine study authors had to assess expected household income tax brackets for their sample); (c) choice of experimental design (e.g., mechanical use of experimental designs, such as the orthogonal factorial design, can generate options that are not credible to respondents – what is considered to be plausible and realistic is to be determined in the pilot phase); and, (d) construction of choice sets.
- 7.23 **Definition of the Geographic and Analytical Boundaries of the Ecosystem:** this is an important stage of a forest valuation and is therefore listed among topics in section 7.5 (above) warranting a guideline. Geographic boundaries must encompass: (a) suitable on-site locations to intercept respondents for an on-site survey (e.g., gate entry points, representative households, or, a locale containing significant concentrations of user groups dependent on the services supplied by the forest; and, (b) environmental assets / attributes of interest for each aspect of the study (e.g., purposive / stratified sampling may be used for DUV analysis by ensuring villages located nearby the different assets being valued are included; similarly, locales that are by definition remotely located should be included to assure respondents are those to whom NUVs accrue, assuming existence, option use, and bequest values of forests are sought).
- 7.24 Defining analytical boundaries relates to the selection of assets / attributes to be valued and, for each, noting down a preliminary list of data requirements in order to undertake the methodology. The aim of the study and intended use of the results will help prioritize assets / attribute selection. The list of data requirements and the methodology are dependent to a large extent on the project’s available resources (time, expertise, and money). The requirements will also be judged on feasibility – i.e. depending on such factors as the quality of existing (secondary) data, or, inclination of potential respondents to participate in the survey. The preliminary list of data requirements will itself help shape and define what qualifies within the scope of a DUV, an IUUV, and a NUV for the type of forest valuation being conducted. The exercise should be conducted first among those commissioned to conduct the study. Subsequently, the list of requirements should be vetted by key informants to assess the feasibility of collecting comprehensive and high quality data.

- 7.25 For DUVs, one could typically expect to see the following included within data requirements: collection of wood products and associated input costs; sale / transaction and consumption of wood products; NTFPs but also “by products of hunting” such as mustard seed and cotton which are planted expressly to attract game; and, enterprise based on the wood products, NTFPs and by-products of hunting. These DUV information requirements, and not those for various IUVs and NUVs, are singled out because they are perhaps highly context specific and more so than the kinds of IUVs and NUVs one can expect to find<sup>5</sup>.
- 7.26 **Identification and Profiling of Households:** in surveys involving villages / households, once geographic and analytical boundaries and preliminary data needs have been established, researchers must define the sample to be taken from the “sample frame”, i.e., the entire population. In the case of TCM, on-site sampling is cost-effective and an acceptable sampling method; nevertheless, econometric issues that need addressing arise: e.g., truncation (where there is self-selection by those who visit the forest and where zero-demanders are absent from the sample – this is expected in Pakistan since the cost of sampling off-site is exorbitant given high populations), overdispersion (where variance is greater than the mean), and endogenous stratification (where the sample average number of trips is expected to be higher than the population mean due to the on-site interviewing process being inherently likely to intercept avid visitors). Endogenous stratification and truncation biases regression coefficients (this is a graver issue than biased standard errors) so that either the Negative Binomial or the Poisson Regression Model would need to be fitted, depending on standard statistical criteria.
- 7.27 The US Federal Register of 15 January 1993 on the subject of CV, section IV (“survey guidelines”), there is mention of probability sampling being essential for damage surveys while “the choice of sample specific design and size” is considered to be a “difficult technical question that requires guidance of a professional sampling statistician”. It also points out that a high number of non-responses would make the survey results unreliable. The report’s recommendations also illustrate the fact that sampling is highly tailored to technique being applied – in the case of CV, “drastic reform” of then outdated sampling guidelines is prescribed, including the need to take into account clustering and stratification since face to face interviews are undertaken and the need to ask for separate valuation amounts from random sub-samples if dichotomous valuation questions are used. This also then illustrates that not only the choice of

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<sup>5</sup> WWF considered inclusion of a NUV relating to the cultural significance of agricultural / forest land in its 2008 TEV study based upon a suggestion made by Mustafa Talpur, formerly Programme Coordinator, Indus for All Programme, WWF-P. The notion is not so singular if one considers potentially protectionist appeals made in international trade fora for recognition of the concept of “multifunctionality” to justify subsidies made to protect farmers. In a paper prepared some ten years ago, the European Commission defined multifunctionality to encompass a number of functions including “the management and enhancement of rural landscape” (see European Commission. 1999. “Contribution of the European Community on the Multifunctional Character of Agriculture”. Info paper).

technique, e.g., CV, but also the course chosen within its application (e.g., use of dichotomous valuation questions such as “hypothetical referenda”) will affect sample design.

- 7.28 The need to consult sampling statisticians in the design of forest valuation surveys cannot be sufficiently underlined. It is assumed that the consultant undertaking the valuation can econometrically unscramble responses obtained from questionnaires to estimate the underlying population mean or median. It cannot be assumed that the consultant will know how to undertake effective sampling in each case. For example, seasoned statisticians working at the Community Health Science (CHS) Department of the Aga Khan University Hospital (AKU) were consulted by the WWF for valuation work it undertook on a CE that covered forests. In particular, in WWF (2008), the CE required a representative sample of Karachiites (population: 15 million in 2008), and sampling relied on a modified two stage cluster sample developed by the World Health Organization in 1978, the 30 by 7 cluster sampling method. It is recommended for its cost effectiveness and for the fact that obtaining lists of the units in the population is needed only for units in the cluster, though it is statistically less precise than a simple random sample and not intended for calculation of estimates from within clusters. The sample size for this approach is set at 210 and a door-to-door survey within enumeration blocks (units containing houses / apartment buildings) is used.
- 7.29 As regards sampling of villages, e.g., for a DUV computation involving villages adjacent to a forest, estimating the required sample size in order to obtain a 95% confidence interval of and an error of +/- 5% requires application of standard statistical formulae. Clusters may be defined and, further, clusters could be defined as villages that are stratified, for example, into hamlet, small, medium and large villages. Oversampling may be justified for purposes of covering important user populations (e.g., those located near and collecting NTFPs regularly). Typically, proportions of villages are used to select a proportional sample from the population of villages. The number of households from villages is selected in order to satisfy the selected confidence interval and error level. Villages and households are then typically randomly sampled. There are many types of sampling strategy and many approaches, for example Simple Random Sampling (SRS), Stratified Random Sampling and Clustered Random Sampling (CRS). It is sufficient for those commissioning the study to be aware that the strategies, approaches, and choices are vast and determined among others by cost considerations. CS and its variants are generally selected due to cost savings. Caution should be exercised vis-à-vis the “design effect” which measures the accuracy of which the accuracy of a survey design (using any sampling strategy) differs from SRS.
- 7.30 **Identification of the Forests’ Components/Assets, Functions/Services and Diversity/Attributes:** while proceeding with identifying the scope of DUV, IUV, and NUV studies to be undertaken and determining the preliminary information requirements, environmental economists need to identify assets, services, and attributes for the forest type under consideration. If these information needs are correctly appraised, the task of determining

resource constraints to obtaining primary and secondary information, the data collection methods required, and the appropriate choice of valuation technique will all be facilitated.

- 7.31 For the 10 different forest types, section III of the present guidelines list products and services into components / assets (wood and non-wood), functions and services (e.g., soil fertility maintenance, microclimate stabilization), and diversity and attributes (e.g., biodiversity). The different parameters are brought into line with the Pakistan context by assigning low / medium / high rankings (see key at the bottom of each table). In particular, the rankings refer to importance to the assessment.
- 7.32 As regards rankings contained in the tables for forest types 1-10 (section III), these take into account the possibility of applying any of the techniques listed in Section II, Tables 1 and 2, of the present guidelines. Tables and ranks were reviewed by WWF-P economists, in consultation with key informants and stakeholders present at the national consultative workshop (28.1.10). Guidance on using the tables in section III is as follows:
- (a) a consultative meeting should be held to list project-relevant entries under the headings “components / assets”, “functions / services”, and “diversity / attributes”;
  - (b) after listing, entries should be ranked using the low / medium / high rankings (see key at the bottom of each table in section III);
  - (c) next, preliminary information requirements should be listed for each of the listed items under the “components / assets”, “functions / services”, and “diversity / attributes” headings; and,
  - (d) based on objectives and resource constraints, principal techniques should be selected for estimating values for chosen DUV, IUV and NUV items.
- 7.33 **Data Requirements by Technique and Forest Type:** We begin by looking at revealed preference techniques. In the TCM, informational requirements may be grouped into three: (1) household characteristics; (2) site quality; and, (3) choice of on-site activity, as per 7.20 above. The essential data to generate from (1) includes individual income, household income, other characteristics that would explain number of visits undertaken by those recreating at the forest (e.g., membership of Adventure Foundation Pakistan), and number of holidays / casual / medical leave availed and whether visitors would be working instead for a typical visit and whether payment would be received in such cases (the latter questions are designed to construct separately binding or single constraints for time and budget constraints).
- 7.34 The data to generate from (2) can be highly scientific and relate to pollutants, or, water and air quality as it impacts forest assets (wood and non-wood). This assumes the presence of data on such parameters for the site itself as well as substitute sites, since this would affect the demand for recreational experience at any one site. It must be remembered that each time an individual chooses to visit a given forest, they select among a larger set of sites / activities / destinations

that are differentiated not only by dissimilar costs but different qualities<sup>6</sup>. According to Haab and McConnell (2002), “by allowing a single quality measure to interact with an individual-specific covariate, one can coax out the demand for site quality. They note that if time series data were available where quality variables changed over the course of time, then a single site could provide sufficient information to estimate the effect of quality. However, time series data, or, for that matter, reliable scientific data sets are unlikely to be present in Pakistani forests for TCM recreational demand model construction. Data on (3), i.e., choice of on-site activity, should extend to cover any activities day visitors are expected to engage in, including short walks, hiking, picnicking, mushroom picking, bird watching, hunting, and just resting.

- 7.35 Note that there are general informational requirements for all TCMs that are essential to constructing standard explanatory and dependent variables. Without going into the detailed construction of the variables, we note that visits are considered to be a function of the cost of travel (petrol and opportunity cost of time mainly), income, and other socioeconomic characteristics likely to explain the number of visits. Informational requirements within the attribution of travel costs can be extensive when quality studies are undertaken -- e.g., depreciation on vehicles (unlike the US there is no “Blue Book” in Pakistan listing depreciation by vehicle for all models and years) and use of GIS methods to estimate one-way distances covered. As regards forest types, there are some types which dominate within any single site and are arguably sought by visitors as part of their recreational experience. For example, mangroves dominate and are an inextricable part of the experience for WWF Wetland Centre visitors who engage in a boat safari at Hawks Bay / Sandspit. While constructing a TCM and considering informational requirements for the different forest types, tables 1-11 in section II should be consulted.
- 7.36 The Hedonic Method (see table 1, section II) relies on information about market transactions for differentiated goods. Here real estate agencies need to be contacted for information required to value forest views or forest proximity within the price of a house. This information typically covers physical characteristics (e.g., number of rooms, windows, etc.), rent and sale price information, as well as distances. Transfers and sales prices are also recorded by tax authorities, home owners, and local government authorities. Sales prices recorded in transfers are expected to be underestimated since property tax calculations can be based on these statements. In hedonic property models, neighborhood and environmental characteristics each deal with location and quality. As regards neighborhoods, the informational requirements typically cover presence and quality of schools, health centers, level of crime, average income, average age, and ethnic composition. Distances play an important role in the hedonic price function where the parameters are, depending on the study, such things as forest itself, town centre, railway station, and highway, as measured in kilometers. A good example in the Pakistan context is

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<sup>6</sup> A note on choice and model specification: the Random Utility Model (RUM) TCM and use within the RUM TCM class of models of nested multinomial logit (NML) models or probit models is considered to be a more realistic characterization of households’ choice when recreating as compared to models not using the RUM framework.

proximity to gundah nallahs (open sewers). The same parameters enter into so called “spatial heterogeneity” and “spatial dependence” analyses.

- 7.37 Under the categories of change in productivity, loss of earnings, and defensive / preventative expenditures (see table 1, section II), among revealed preference techniques, we note the application of dose response, damage function, and production function approaches. The first of these, establishing as it does a relationship between environmental damage (or the “response”, e.g., soil erosion) and some cause of the damage (or the “dose”, e.g., deforestation), and examining effects on quantities and values of goods and services, would require information on soil quality parameters, numbers of trees and deforestation rates, and agricultural yield and prices, depending on the context. The second is also data intensive as regards crop yields. The third can relate support from a forest to downstream fisheries and, to that extent, data would be needed on forest watershed area and catch, among others.
- 7.38 Again, users of the guidelines are invited to consult tables 1-11 in section II where the different forest types are described. Also, EEPSEA (1997) contains a valuable discussion of information requirements for benefits transfer (BT). In the case of BT, the location where the data are generated is known as the “study site,” while the location where the benefits are transferred to is known as the “policy site”. Wholesale transfers and adjustments to data are discussed for forest policy sites. For example, discount rates would need to be adjusted to Pakistan while transferring net present values, also, unit values per unit of time would need to be calculated. The preponderance of available NTFP values estimated for Amazon, West Africa and Southeast Asia is highlighted.
- 7.39 We now look at stated preference techniques. The data requirements of CV and CE depend largely on the design of the questionnaire. In the case of CV this refers to principally to the hypothetical scenario that is framed, the payment vehicle (e.g., local tax, or, entry charge), for improvements information on willingness to pay (WTP) is elicited, for losses information on willingness to accept (WTA) is elicited, and the elicitation method (e.g., bidding game, payment card). For both CV and CE, the biophysical data requirements for NTFPs may be grouped into types of products (e.g., types and number of tree species, types and number of trees yielding marketable products such as mazri or ephedra, types and quantity of wildlife), different uses of products, rates of biological productivity, and data on harvest rates. Data is further needed on costs of inputs (N.B., it is always important to include own labour), use rates of inputs (e.g., rate of depreciation of capital input), prices of outputs (i.e., not just the market rates but costs of transport and harvesting) and other information such as seasonal harvest rates and prices trends. Local and rural wage rates, prices of substitute products, and rates of exchange between products are often sought as well. For further detail on data requirements for NTFPs, as well as results from studies up to the mid 1990s, see EEPSEA (1997). Examples of data requirements in the design of a CE are presented in 7.21 above.
- 7.40 **Consensus on Choice of Models/Techniques by Forest Type:** this issue is a highly context-specific one, depending on the outcome of the ranking exercise described in 7.32 above. The

national workshop of 28.1.10 was consequently not expected to provide definitive consensus on which to use for any given forest type.

- 7.41 The rule in selecting a model / technique over another, for any given forest type, should above all be assessment of reliability and validity, i.e., the extent to which a measurement is replicable and the degree to which the study measured the intended quantity. The focus should however remain on validity since reliable studies can produce invalid measurements. One approach for reliability, taking the example of a CE of forests, is to compare the stability of the estimated bid function in repeated samples. Content validity checks for CV, e.g., include asking whether the good presented is understandable to respondents from a wide range of backgrounds and educational levels, and whether the payment vehicle was plausible. A convergent validity check will assess if different valuation techniques will produce similar answers, or answers that vary in a predicted manner. In this regard, several papers in the literature, including for forest valuations, apply the CV and TCM together.
- 7.42 Those commissioning a study are recommended to review the literature and assess which models / techniques have been used by authorities on the subject. The objective should be to ensure that the technique is appropriate to the policy objective while not exceeding resources available, including expertise. Besides this, it may be added that, as a general rule, NUV (and stated preference techniques best capturing NUV) will be selected when the object (i.e., forest) or impact being valued has few substitutes.
- 7.43 **Questionnaire Design:** this issue is addressed in 7.14 – 7.21 (above) and implicit in 7.33 – 7.39 to the extent that data requirements are met by incorporating the corresponding / relevant questions in the survey instrument. Pursuant to these issues, in summary we note that questionnaire design should be such as to minimize non-responses, to present sufficient and accurate background information (especially in the case of stated preference techniques) so that the basis for the observations obtained is valid, and worded so as to perspicuously and unambiguously designate content. As regards the latter, a number of conferences that have debated the value of particular studies have dismissed the results of studies on the basis of how questions were ill phrased and therefore were neither conceptually clear to those administering the study nor effective in conveying to respondents the intended message<sup>7</sup>.

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<sup>7</sup> Taking the example of a discussion surrounding a Californian coastal waters study, an important explanatory variable was expected to emerge from the following question “does your household own a boat that is used primarily on coastal waters?” but was thought to result in a great deal of information loss owing to its phrasing. In particular, conditioning use to primary use suggests that if one used one’s boat 51% of the time in freshwater and 49% of the time in coastal waters then the question says that it is not important to know that one uses one’s boat 49% of the time in coastal waters. This comment is attributed to Bob Leeworthy of the National Oceanographic and Atmospheric Administration (NOAA) and was made in reaction to Owens N and N Simon’s questionnaire accompanying their study on “the Value of Improvements to California’s Coastal Waters: Results from a Stated Preference Survey”. See “Valuation of Ecological Benefits: Improving the Science Behind Policy Decisions –

- 7.44 **Model Specification for Revealed and Stated Preference Techniques:** Recall that, as per section I, sub-section 3.15, that models have different ‘specifications’ or ‘functional forms’. For example, the TCM can have any one of the following specifications, among others: ‘conditional logit’, ‘binary logit’, ‘multinomial logit’, or, ‘multinomial probit’. It is not our purpose to prescribe the use of different specifications for the different instances, as is taught in econometrics and applied economics courses. Rather, we note, principally for the benefit of those commissioning and verifying the quality of completed studies, that the functional form of a model has a strong effect on the magnitude of welfare estimates. It is common practice to test several functional forms and discuss their relative merits using, among others, criteria relating to empirical support for economic theory and statistical robustness.
- 7.45 **Accuracy, Necessity and Sufficiency when Examining overall TEV Computation:** those commissioning the study need to make a judgment about how accurate any overall TEV (or DUV, IUV, NUV separately) computation estimates need to be for the question at hand. It is better to make this judgment before field work is undertaken in that it would affect sample size and questionnaire design (see sections 7.26 – 7.29 and section 7.43, respectively). For projects and policies that are large scale and / or likely to have major consequences, accuracy of benefit estimates will matter. A rough guide to the magnitude is the cost of measure itself. The cost of negative externalities of the projects and policies that are large scale and / or likely to have major consequences should be considered to evaluate if the project is expensive – the absolute cost will not be indicative.
- 7.46 In terms of necessity and sufficiency it is noted that, if a budget is insufficient, a benefits transfer study (BT) should be selected over a poor stated preference or revealed preference study. If a BT is selected, one needs to be certain that the context is one where there are adequate (primary) “study site” findings that can be transferred to the “policy site”. A meta-analysis is expected to be undertaken when a sufficiently large number of primary studies characterize the context. There are a number of standardized databases that are beginning to appear including by EUROFOREX at <http://www.medforex.net/e45/index.htm>.
- 7.47 Finally, the process of ranking (see 7.32 above), using rank tables (provided in section III) prioritizing components/assets, functions services, and diversity/attributes for each forest type should be undertaken. This will help determine which welfare measurements are the most important to undertake, and which can consequently be dropped. A partial valuation requires care in justifying since the impression given from the outset will be that monetized impacts are more important than non-monetized ones.
- 7.48 **Collection of Missing Primary Data and Collection of Secondary Data:** primary data sometimes is insufficient and needs to be bolstered by returning to the field. Contingency

budgets and overall provision for this need to be made at the outset of the project. Secondary data forms part of the overall issue of identifying data needs which is detailed in section 7.32 above.

- 7.49 **Analysis, Interpretation and Presentation of Results:** forest TEV results, like other benefit estimates for Pakistan, must be presented using a sensitivity analysis (for discount rates of 1%, 5%, 10%, 15% and 20%). If there are assumptions relating to the net present value (NPV), e.g., conservative 30 year time horizon, or, a limitless time horizon, this needs to be made clear. Final findings in the case of Pakistan should be interpreted with reference to the 10% discount rate. This corresponds to the average yield of the 6 month T-Bill for the past 15-20 years (about 10% between March 1991 and April 2009). This is a conservative benchmark for the time value of money in Pakistan. PIBs are probably better instruments to obtain average yields from for this purpose, but data available only from 2001 onwards.
- 7.50 There is a perception, whether justified or not, that stated preference (SP) results are less credible than revealed preference (RP) results. The reason is simple: willingness to pay (WTP) estimates from RP results show up in actual markets (e.g., housing, land, labour, etc.) rather than hypothetical ones. The size of the hypothetical bias associated with SP may not be easy to determine. However, among the RP techniques, estimates resulting from two-stage hedonic price estimation can be very uncertain.
- 7.51 When presenting / interpreting results of a TCM, it should be made clear that the results describe recreational use values alone, in turn a single strand within DUV, which in turn is but one component of TEV (the others being NUV and IUV). This illustrates the need to contextualize the technique and situate the NUV / IUV / DUV estimates in relation to TEV. The intrinsic merits of the technique need to be discussed, along with the quality of the scientific and physical data collected for the forest, and quality as measured by care in conforming to high procedural standards.