THE ECONOMIC VALUE OF A BIOMASS HARVESTING PROGRAM
A Non-Market Valuation Study Design

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Policy Question

How can the United Nations Development Programme in Lebanon assess the total economic value of a biomass harvesting program?

In addressing the policy question, the United Nations Development Programme in Lebanon further indicated interest in a detailed approach of the methodology chosen for assessing the total economic value of the proposed biomass harvesting program.

Background

The United Nations Development Programme in Lebanon, hereinafter also referred to as the client, is undertaking an initiative to explore energy efficient applications throughout Lebanon by investigating opportunities for renewable energy applications. The main goals of the initiative are to spur local development and provide a clean source of local energy in Lebanon. Before undertaking any initiative, the client conducts a cost benefit analysis to evaluate the tradeoff between the local benefits and costs. Although an initiative may provide the benefit of producing a source of clean energy from an environmental good, it may lead to costs. One category of costs may include the foregone benefit of not using the respective environmental good for another more beneficial endeavor.

More specifically as part of the initiative, the client is currently implementing a biomass fuel strategy in Lebanon. The biomass fuel strategy involves the proposition of biomass harvesting plans in two municipalities in Lebanon; Bkessine and Andket. The biomass harvesting plans involve the pruning, cutting and pressing of forest residues into a source of fuel treated through a briquetting process. In reference to the tradeoff between benefits and costs, the biomass fuel strategy provides the benefits of using a renewable resource for energy that is carbon neutral. On the other hand, the biomass fuel strategy may lead to costs such as displacing the use of the forest for other endeavors that may be more beneficial for local development.

To properly address the tradeoff between the benefits and costs of the strategy, the client is concerned with assessing the value of the biomass harvesting portion since it has a direct impact on the environment through changing forest conditions. The client seeks to value, in monetary terms, the biomass harvesting program’s total economic value. The total economic value of the program, comprised of its impact in the local economy to its impact in changing the conditions in the forest, could be used as an input in the cost benefit analysis. In this case, the program’s total economic value could be contrasted against the cost of the foregone benefit of using the forest for other purposes among other costs.

According to Solino, M., Prada, A. & Vazquez, M. (2009) and Tabatabaei, M., Loomis, J.B. & McCollum, D.W. (2015), the impacts of a forest management program similar to a biomass harvesting program with respect to forests, includes the reduction of the risk of

1 The client currently has a detailed forest inventory and proposed biomass harvesting plan for both the Bkessine and Andket forest in their UNDP October 2016 publication titled “Forest inventory and management plans of Bkessine and Andket forests in Lebanon.”

2 For a more comprehensive list of the local economy and environmental impacts of a biomass fuel strategy refer to Appendix G.
forest fires. Reducing the risk of forest fires includes benefits such as preserving the biodiversity of the forest, the quality of the forest’s water resources and reducing carbon dioxide emissions from forest fires. The benefits that may arise from the program from an economic and societal standpoint originate from increasing local employment and diversifying Lebanon’s energy resources towards more renewable energy sources.

However, forest benefits of the proposed program that ensue from the reduction of forest fire risk are regarded as non-marketed benefits. By valuing the program as a whole, the client needs to ensure they incorporate such non-marketed benefits in their cost-benefit decision. The failure to incorporate non-marketed benefits in cost benefit decisions arises from the absence of a market valuing all of a forest’s goods and services besides timber. Forest goods and services include wood products (direct use values); watershed protection, carbon storage, and carbon storage (indirect use values); and wildlife habitat and inter-generational bequest value (non-use values).

In the case of forests, such non-marketed benefits may include biodiversity, watershed protection, carbon storage, bequest value, and existence value (Bishop, 1999). The proposed program’s total economic value must include non-marketed benefits regardless of whether or not the benefits are priced in a market.

Since the program’s non-marketed benefits are not valued, due to an absent market, they tend to be underprovided relative to the optimal level. So the need for a nonmarket valuation becomes crucial in correcting for the market failure in underproviding goods with benefits (Champ, P., Boyle, K. & Brown, T., 2017). Over the past two decades, economists have contributed greatly to developing and applying methods for valuing environmental and developmental non-market benefits in monetary terms to help the public and private sector make more informed decisions about activities with environmental and developmental impacts (Freeman, Herriges, & Kling, 2014). Such methods fall under the umbrella of non-market valuation.

**Introduction to Non-Market Valuation**

A non-market valuation, particularly for environmental and developmental benefits, attempts to estimate consumer demand for a particular non-marketed benefit in monetary terms (Bishop, 1999). In other words, a non-market valuation attempts to extract the preferences of consumers for a non-marketed good by determining the amount they are willing to pay for the good. With no market, an individual cannot make a purchase of environmental resources to express their preference for forest benefits for instance. Two main non-market valuation methods have been proposed to elicit information about the values of such preferences; the revealed preference method and the stated preference method.

Revealed preference methods infer environmental benefit values from observed consumer behavior that may be reflected in the market of a related good (Boardman, A., Greenberg, D., Vining, A., & Weimer, D., 2011). Inferring values of environmental benefits from the travel cost of visiting a recreational forest site that households incur is an example of a revealed preference method. This implies that revealed preference methods require a market for related forest good with substantial data on price and other characteristics in order to carry out a statistical analysis to estimate the value of the non-marketed good.
Stated preference methods infer non-marketed benefit values from a hypothetical scenario administered through a survey. In this approach, obtaining the value of the program’s benefits requires directly asking survey respondents about their willingness to pay (WTP) for a hypothetical forest program after describing the impact the program has on current forest conditions, along with the other impacts of the program (Bishop, 1999).

Unlike stated preference methods, revealed preference methods fall short in measuring most indirect and non-use benefits such as the value placed on future Lebanese generations inheriting the forest or a clean environment (Krutilla, 1967; Champ et al., 2017; Bishop, 1999). The concept of non-use benefits, which is synonymous with existence and passive benefits, involve individuals’ preferences for environmental goods and services not derived directly from their use (Mansfield et al., 2012).

Since the client is interested in also assessing the non-use benefits of the forest, revealed preference methods will not be delved into much further due to its limitations in assessing the program’s value with respect to non-use benefits. Also, data for a market of a related good to the forest is lacking in Lebanon.

However, it is worth briefly noting the criticisms of stated preference methods. Such criticisms include findings that are inaccurate or unreliable, the scenarios that describe the environmental change are poorly crafted, surveys are administered poorly and whether the results are robust to variations in the survey method or research design (DeShazo et al., 2015). The paper discusses approaches that adequately address the abovementioned criticisms.

**Stated Preference Approaches**

The two main stated preference approaches are contingent valuations (CV or CVM) and choice experiments (CE).

CV is a survey based approach that presents respondents with the current condition of a good or service and a scenario of a potential change in the quality of the respective good or service brought upon by a proposed program. CVs attempt to elicit respondents to disclose the amount they would pay to implement a program after understanding the changes to the quality of the good or service.

CE is also a survey based approach but it asks respondents to choose among alternative bundles of environmental non-market goods which are described in terms of their attributes along with a hypothetical price (Bishop, 1999). In the case of forests, a choice experiment survey could present respondents with “alternative landscapes (in the form of images), which vary by species mix, age diversity, percentage of open area, the presence of roads and the hypothetical price” (Bishop, 1999, p. 17). So respondents could be asked to choose between different biomass harvesting program options characterized as bundles of attributes related to the management activities and the outcomes of those activities such as the number of acres of land harvested for biomass and the number of reduced forest fires per year.
The table below offers the main key distinctions between a CV and CE approach.

**Table #1: Contingent Valuations vs. Choice Experiments**

<table>
<thead>
<tr>
<th>Survey Component</th>
<th>CV</th>
<th>CE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothetical Scenario</td>
<td>Defines the change in one written scenario</td>
<td>Defines the change using different levels of attributes</td>
</tr>
<tr>
<td>Respondent Choice Request</td>
<td>Asks respondents to choose between the change and a status quo condition</td>
<td>Asks respondents to choose between two or more changes and a status quo condition</td>
</tr>
<tr>
<td>Number of valuation questions asked</td>
<td>One valuation question</td>
<td>Multiple valuation questions</td>
</tr>
</tbody>
</table>

Source: Champ et al. (2017)

The choice amongst either utilizing a CE or CV is based on whether or not the intended valuation is of the proposed environmental program in its entirety or its effect on each forest attribute it impacts (Hynes, Campbell, & Howley, 2011). In the context of the policy question, CVMs take a more holistic approach by valuing the change from current conditions elicited by the biomass harvesting program. Similar to CVMs, CEs also elicit a value of the overall change of employment, forest, and renewable energy mix conditions. Unlike CVMs, CEs have the additional advantage of determining the program value attributed to each of the program’s benefits being considered. In order to determine the program value attributed to each program benefit, CEs present respondents with usually three or more program alternatives that are described in terms of usually three or more attributes. The number of alternatives presented to respondents is inextricably linked to the number of attributes the CE researcher intends to value. A CE with one alternative, two attributes inclusive to cost, and one valuation question would be quite similar to a CV study. However, as is often the case, programs have multiple attributes that need to be considered. As a result, CE surveys are usually longer than CV surveys.

The table below offers a brief overview of the different advantages and disadvantages of the CV and CE approach.

**Table #2: Advantages and Disadvantages of the CV and CE Approach**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>CV</th>
<th>CE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Values program as a whole</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Values each attribute/impact of the program</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Requires design of multiple program alternatives</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Requires longer survey instrument for a given level of attributes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

3 The CV chosen for comparison is a CV that uses a dichotomous-choice question (Refer to Step 7.1).
In reference to the policy question, both CVMs and CEs would adequately value the program as whole based on the changes to the abovementioned program impacts.

Although CEs have an additional advantage over CVMs in determining the value of each of the program’s impacts, CEs involve considerable effort and time in design relative to CVMs (Adamowicz, Boxall, Williams, & Louviere, 1998). The issue with CEs involves how to choose the environment or policy characteristics to consider as part of the choice experiment, such a process is known to be subjective (Hynes et al., 2011; Hanley et al., 1998). In comparison to the CV approach, CEs often burden the respondent with more cognitive difficulty when they consider alternatives with multiple attributes. Respondents who are required to assess complex trade-offs between attributes may resort to decision heuristics that are not well understood and may not reflect how they would make actual market choices (Champ et al., 2017).

The policy question is more concerned with valuing one proposed program as opposed to alternative programs that vary on the level of attributes that make up a biomass harvesting plan. CVMs would address the policy question in a more cost effective and time efficient manner. Hanley et al (1998) concluded in their study that CVMs are best suited to value the overall policy package in contrast to CEs. Also, the willingness to pay estimates derived from both a CV and CE on the same policy program were found to be similar with an insignificant difference in multiple stated preference comparison studies (Hynes, Campbell, & Howley, 2011).

Overall, based on my opinion, the most suitable approach to pursue would be the contingent valuation approach. However, given the discussion above, the client should review whether revealed preference methods would be more suitable than state preference methods. If stated preference methods are deemed more suitable by the client, the client should review whether choice experiments would be more suitable than the contingent valuation approach.

**Conducting a Contingent Valuation (CV) Study**

This section will examine the best practices for carrying out a CV study, as well as propose a recommended approach for each CV study component within the context of the policy question. The recommended approaches are based on technical facts that generally follow the best practices proposed in CV methodological research papers.

The CV study will be specifically addressing the impact a proposed biomass harvesting plan will have on the environment and economy. Hereinafter, the study will also be referred to as the Andket Forest CV study.

I will be relying on Champ et al. (2017) as a basis for identifying the steps required in conducting a contingent valuation study. To ensure the key steps proposed in Champ et al. (2017) are exhaustive, I also relied on Pattanayak et al. (2007) and DeShazo et al. (2015).

In addition, I included steps with regards to further considerations the client must undertake during survey administration.

Please refer to **Appendix A** for a summary table of my recommended approaches for each CV step discussed below.
Step 1 Identify the changes(s) in quantity or quality to be valued

The main objective of this step is to determine the change to be valued. With regards to the biomass harvesting policy, the CV survey will explain all the impacts and changes that originate from implementing the biomass harvesting program on forest and economic conditions such as reducing forest fire risk and increasing local employment. It is crucial that all the impacts of the program are clearly studied and any proposed impacts are validated by subject matter experts. Respondents need to clearly understand how conditions will change after implementing the biomass harvesting program. The value that respondents attribute to the program originate from their clear understanding on how the levels of employment or environmental conditions will change. Clearly quantifying the impacts of a proposed program that has not yet been implemented is a challenge that requires an interdisciplinary team. Hence, Step 1 involves the condition change that CV survey respondents are asked to value.

I recommend consulting a forest and environmental expert in Lebanon to determine the relevant changes in forest and environmental conditions due to the implementation of the biomass harvesting program. The key design consideration with respect to the CV survey is to avoid descriptions of condition changes that are vague, confusing, or wrong (Champ et al., 2017). If a point estimate of the impact can’t be clearly determined, I recommend providing a range that captures the low end and high end of all possible impacts.

Also, I recommend referring to Solino, M., Prada, A. & Vazquez, M. (2009) for a good overview on the environmental and economic impacts of a biomass harvesting program.

Step 2 Identify whose values are to be estimated

This step involves identifying the affected population and selecting a sampling procedure.

Affected population

The policy question seeks to estimate the total economic value change brought upon by the biomass harvesting policy, this includes non-use environmental benefits (Bishop, 1999). As a result, the sample needs to include residents living throughout Lebanon, not only residents within the vicinity of forests who may be affected directly by the biomass harvesting program. For some people the benefits of a forest program, such as the biomass harvesting program, are unrelated to their own on-site use.

However, it is pertinent to note that if the client is more concerned with an economic value of the program that originates mostly from use-benefits and not non-use benefits, sampling residents in the Andket region would be more optimal. Since residents of Andket directly benefit from the program since they live near the forest and may be employed by industries that provide a good or service related to the forest.

I recommend defining the affected population as residents living throughout Lebanon to ensure the total economic value of the program accounts for non-use benefits. Thus the selected sample needs to be fairly representative of the Lebanese population.
Sampling Procedure

Given that the CV study should be generalizable and representative of the overall Lebanese population, a probability sample which requires the random selection of CV survey respondents is recommended. “Probability sampling provides the payoff of statistical inference, the ability to make statements about the population with known levels of confidence using data from a single sample” (Groves et al., 2009, p. 99).

To further ensure the sample is representative of the Lebanese population, I recommend utilizing a stratified random sampling approach. The probability sample can be improved with features, such as gender or income, to ensure the representation of population subgroups in the sample (Groves et al., 2009). Stratified random samples are the most widely used method in contingent valuation studies (Pattanayak, S., Choe, K., Yang, J. & Gunatilake, H., 2007).

Other random sampling approaches the client may consider include simple random sampling, cluster random sampling, quota sampling, and spatially referenced sampling4.

Overall, I advise the client to consult a survey statistician about any or all sampling procedures stated above before implementation. Please refer to Groves et al. (2009) for an adequate explanation of the various sampling procedures, specifically refer to Pattanayak et al. (2007) for an explanation on stratified random sampling within the context of a CV study.

Unit of Measurement

An important element to consider is the unit of measurement, synonymous with sampling unit, used in the contingent valuation study. The framing of questions in the CV survey should make explicit whether a household or individual valuation is being requested. Multiple studies have shown that the aggregate measure of willingness to pay elicited through a CV study may not be equal between individual value studies versus household value studies if certain restrictions on household member utility functions and interactions do not hold (Bateman, I. & Munro, A., 2009; Munro, 2005; Lindhjem, H. & Navrud, S., 2009; Quiggin, 1998). Addressing the unit of measurement is crucial since it influences what payment vehicle is selected (Refer to Step 5.3 Below) and the availability of a sampling frame.

Champ et al. (2017) poses the following questions to determine the choice between individual or household sampling units: “[1] Do households make individual or group decisions? [2] If they make group decisions, do households pool their income? [3] If they make group decisions, do decision-makers adequately account for the preferences of all household members? [4] Do some households make group decisions and others make individual decisions?” (Champ et al., 2017, p.91).

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4 Spatially referenced sampling allows the CV researcher to determine how the distance of a respondent’s household from Andket forest could influence a respondent’s value of the program (Bateman, I., Day, B., Georgiou, S. & Lake, I., 2006; Hanley, N., Schläpfer, F. & Spurgeon, J., 2003; Mansfield et al., 2012).
Please refer to the table below on the selection of a unit of measurement based on the answers to the questions posed above from Champ et al. (2017).

**Table #3: Unit of Measurement Selection**

<table>
<thead>
<tr>
<th>Question 1</th>
<th>Question 2</th>
<th>Question 3</th>
<th>Question 4</th>
<th>Unit of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual Decisions</td>
<td>N.A.</td>
<td>N.A.</td>
<td>No (Yes)</td>
<td><strong>Household (Individual)</strong></td>
</tr>
<tr>
<td>Group Decisions</td>
<td>Yes (No)</td>
<td>Yes (No)</td>
<td>No (Yes)</td>
<td><strong>Household (Individual)</strong></td>
</tr>
</tbody>
</table>

I constructed the above table on the selection of unit of measurement using inputs from the following studies: Bateman, I. & Munro, A. (2009), Munro (2005), Lindhjem, H. & Navrud, S. (2009), and Quiggin (1998).

Making the choice between the unit of measurement is useful because it provides more structure on the framing of the valuation question in the CV instrument. Also the unit of measurement is important in determining how to aggregate the respondents value estimates during data analysis.

I recommend using a household unit of measurement. The basis of my recommendation is driven by a recent study which suggests that individuals in a household act similarly (Adamowicz et al., 2014).

**Sampling Frame**

The sampling frame is the list from which sample units are chosen, such as a phone directory database. A suitable sampling frame should be (1) representative of the affected population stated above in the appropriate unit of measurement, and/or (2) sufficiently represent the population subgroups, especially in the case of opting for a stratified random sampling procedure (Deaton, 1997).

When choosing a sampling frame, the client should ensure it meets at minimum the criteria stated above for a suitable sampling frame. A prospective sampling frame in Lebanon that meets the above suitability criteria and may be applied to a household unit of measurement is evident in Dagher, L. & Harajli, H. (2015). The willingness to pay analysis for renewable based electricity in the Lebanese residential sector in Dagher, L. & Harajli, H. (2015) utilized a stratified random sampling method based on geographical and gender characteristics to ensure population representativeness.

Step 3 Select a data collection mode

This step requires the determination of the survey mode used to distribute the CV surveys to respondents. Only the data collection modes applicable to probability based samples are considered below.

Choosing the best mode for administering the CV survey involves tradeoffs in cost, time constraint, context, sample coverage and response attributes.

The CV survey may be administered in two ways: (1) survey respondent completes a questionnaire (self-administered), or (2) an interviewer administers the survey (interviewer-administered).

Self-administered surveys can be administered using paper or electronically through the mail or the internet, respectively. Such surveys usually require fewer resources relative to interviewer administered surveys since the procedures for implementing a self-administered survey are less complicated. For instance, the hiring and training of interviewers is not applicable to self-administered surveys.

A potential drawback of self-administered surveys is the loss of control over the order in which questions are answered. A survey respondent may go back and change their answers to earlier questions based on information presented later in the survey. Another drawback from self-administered surveys is the long time lag between when a survey is sent and when the survey is returned (Champ et al., 2017).

The drawbacks stated above are not applicable to self-administered surveys via the internet since the order questions are presented to respondents may be controlled electronically and the submission of the survey is instantaneous. Self-administered surveys conducted through the internet, also referred to as e-surveys, are gaining in popularity with regards to conducting a CV study. E-surveys have a low marginal cost per completed survey since respondents enter the information electronically saving time and money. Also surveys conducted through the internet may provide respondents with visualization and audio aids when describing the biomass harvesting program and its impact on forest goods and services along with the other program’s impacts.

Lindhjem, H. & Navrud, S. (2011) found no differences in data quality and WTP estimates of a CV survey administered either through in-person interviews or through the Internet. However, it is crucial to note that the final stage response rate of the internet administered survey was lower than the in-person administered survey in the Lindhjem, H. & Navrud, S. (2011) study.

In a review of studies comparing CV studies implemented through the Internet versus phone, mail and in-person implementation, Boyle et al. (2016) found that the ratio of WTP estimates based on Internet surveys to WTP estimates from the other modes averaged 0.92. However, a major shortcoming, quite relevant for developing countries, is the barrier in drawing an adequate probability sample of survey respondents. Not all members of certain demographic characteristics in the affected population of interest are internet users (Boardman et al., 2011).
Furthermore, e-surveys tend to have low response rates relative to most data collection modes calling into question the amount of non-response error generated (Grandjean, B., Nelson, N. & Taylor, P., 2009; Taylor et al., 2009; Boyle et al., 2016; Manfreda et al., 2008). Non-response error usually arises once respondents review the survey material and decide not to participate resulting in important demographics or behavioral characteristics between respondents and non-respondents (Champ et al., 2017). Finally, most self-administered surveys assume all respondents are competent readers of the survey language.

Interviewer-administered surveys are usually conducted in-person or over the telephone. The primary advantages of interviewer-administered surveys include providing clarification if the survey is complex and controlling the order of questions asked in the survey. The interviewer during in-person interviews may provide visual aids when explaining the information in the survey. However, in telephone interviews verbal communication limits the complexity of information that can be provided.

Another main advantage arising from interviewer-administered surveys is the ability to develop a system for choosing participants that avoids the need for the existence of an initial sample frame with contact information (Champ et al., 2017).

One drawback is that interviewer administered surveys tend to be more expensive than self-administered surveys due to interviewer costs. An interviewer, especially in the case for a CV survey, needs to be paid for training, conducting interviews, and travel costs if surveys are conducted in-person. Another drawback of interviewer-administered surveys is that the presence of an interviewer can affect survey responses. The presence of an interviewer may elicit a more socially desirable response in the form of higher WTP estimates for the program’s benefits from survey respondents relative to WTP estimates obtained from self-administered surveys (Groves et al., 2009).

Drawbacks specific to telephone interviews include low response rates, the prevalence of cellular phones breaking down area codes, making it more difficult to sample geographically, and the inability to present visual information (Champ et al., 2009). One way to overcome the information deficiency of telephone surveys is through a mixed mode survey where respondents receive written and visual information over the mail along with conducting a telephone interview (Hanemann, W., Loomis, J. & Kanninen, B., 1991).
Please refer to the table below for a summary of the key characteristics of each of the main survey modes.

**Table #4: Survey Administration Options**

<table>
<thead>
<tr>
<th>Survey Mode</th>
<th>Cost per Completed Interview</th>
<th>Ease of Identifying and Reaching Respondents</th>
<th>Risk of Interviewer Bias</th>
<th>Maximum Complexity of Provided Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In-Person</strong></td>
<td>Very high – depends on questionnaire length and geographic spread</td>
<td>Medium – depends on availability of lists and access</td>
<td>High – personal presence, monitoring difficult</td>
<td>Very high – interactive communication and visual aids possible</td>
</tr>
<tr>
<td><strong>Telephone</strong></td>
<td>High – depends on questionnaire length and callbacks</td>
<td>Very high – random digit dialing</td>
<td>Medium – interviewer cues</td>
<td>Low – verbal communication limits complexity of content</td>
</tr>
<tr>
<td><strong>Mail</strong></td>
<td>Low – depends on number of follow-ups</td>
<td>High – depends on availability of appropriate lists</td>
<td>Low – uniform presentation</td>
<td>High – visual aids possible</td>
</tr>
<tr>
<td><strong>Internet</strong></td>
<td>Low – marginal costs very small</td>
<td>Low – “spamming” restrictions require panels of willing respondents</td>
<td>Low – uniform presentation</td>
<td>Very high – visual aids and interactive questions possible</td>
</tr>
</tbody>
</table>

Source: Boardman et al., 2011, p. 378

For an explanation of additional data collection modes, especially a brief introduction to hybrid and mixed mode data collection designs, refer to Groves et al. (2009). It is pertinent to note that mixed modes of survey implementation lack strong evidence in increasing response rates, especially in cases where respondents are given the option to choose their preferred mode for surveys (Champ et al., 2017; Olson, K., Smyth, J., & Wood, H., 2012; Medway, R. & Fulton, J., 2012).
I recommend the use of in-person, face-to-face, surveys given that in-person surveys tend to have a higher response rate relative to other survey modes, albeit a generally higher cost. Furthermore, given the hypothetical situation and information presented in the contingent valuation survey it is advised that a surveyor be present to guide the survey respondent (Champ et al., 2017). Pattanayak, S., Van Den Berg, C., Yang, J. & Gunatilake, H. (2006) state that the literature on CVs unambiguously support in-person interviews relative to other data collection methods. In-person surveys do not solve for non-responses, but in-person surveys offer higher response rates than other alternative survey modes.

I also recommend that the client consider contacting survey firms in Lebanon to verify if they have an online panel, a database of survey respondents that have become sufficiently large and representative of the affected population. The use of online panels generally leads to lower survey costs relative to other methods and the client would have the data in hand in a short period of time since surveys are usually administered quickly.

In the case of finding a survey firm that guarantees a minimum number of completed surveys from online panel respondents with demographics that match the affected population, the client should pursue the option of an Internet survey approach with the respective survey firm as opposed to an in-person survey. The development of effective online panels has allowed scientifically valid CV studies to be administered through the internet (Berrens et al., 2004). If such an online panel exists, the client should further investigate the methods of survey firms for recruiting respondents to the panel. The American Association for Public Opinion Research provides recommendations with respect to using online panels (Baker et al., 2010). One recommendation involves the choice between probability and non-probability selected online panels. If the main objective is to accurately estimate population values, non-probability online panels should be avoided. However, the association also concludes, “There are times when a nonprobability online panel is an appropriate choice. Not all research is intended to produce precise estimates of population values, and so there could be survey purposes and topics where the generally lower cost and unique properties of Web data collection are an acceptable alternative to traditional probability-based methods” (Baker et al., 2010, p. 714). Another recommendation is that the client should consider the objective behind the survey firm creating the panel. “Users of online panels should understand that there are significant differences in the compositions and practices of individual panels that can affect survey results. Researchers should choose the panels they use carefully” (Baker et al., 2010, p. 715). For other measures assessing survey representativeness, other than response rate, please refer to Groves, R. & Peytcheva, E. (2008) and Schouten, B., Cobben, F. & Bethlehem, J. (2009).

**Step 4 Choose a sample size**

According to Pattanayak et al. (2007), the size of the sample depends on the following determinants:
1) The amount of stratifications used for sampling
2) The acceptable margin of statistical error ranges in WTP values
3) The number of independent variables determining willingness to pay values
4) The available budget and time limitation to complete the CV study
5) The amount of versions of the CV scenario administered
6) The WTP elicitation response format / the number of bids offered (refer to Step 7.1)
In reference to determinant six (6), the number of bids affect sample size since each bid should be administered to a minimum number of households. Selecting the sample size also involves the expected response rate of the chosen data collection mode.

Several possible, but non-exhaustive, approaches in determining the sample size may include the following:

2) Determining the largest possible sample size given the available budget; refer to Maxwell (1994) for an example.
3) Determining the sample size with an acceptable level of precision, standard error, by determining the standard deviation of WTP estimates using similar previous studies.
4) Determining the sample size with an acceptable level of precision, standard error, by determining the standard deviation of WTP estimates obtained through a pretest of the survey instrument

The last two approaches, three (3) and four (4) noted above, make use of the following equation:

\[ \text{se}_{\text{WTP}} = \frac{\sigma}{\sqrt{n}} \]

where \( \sigma \) is the standard deviation and \( n \) is the number of surveys used in the analysis.

When detecting variations refer to small pretests or large pretests in step 10 below.

If the calculated sample size is too large, I advise finding the appropriate sample size that fits the budget and re-designing certain survey components such as the choice of the response format or reducing the number of bids appropriately without sacrificing the study’s statistical inference reliability. For example, conducting a CV dichotomous choice survey with six bids requires a certain fixed amount of households for each bid. Reducing the bids from six to five could result in a required sample size reduction. However, any CV component being considered for change must be adequately pretested.

Refer to Appendix B for a back of the envelop calculation of a possible samples size based on the proportion sampling function. Appendix B should be interpreted with caution since it only offers a general idea of the possible sample size of the study, taking into consideration the other recommendations I noted below; particularly the response format recommended in Step 7.1.

Overall, I advise the client to consult a survey statistician about any or all sampling procedures stated above before implementation, taking into consideration the response format chosen in Step 7.1. Also, the client should consider running a pilot test, refer to Step 10, to determine the variation in WTP estimates and to adequately determine the sample size needed for a given level of power.
Step 5 Select a survey research firm (if applicable)

The client needs to decide whether the implementation of the CV survey would be done entirely on their own or with the assistance of a survey research firm. Hiring a survey research firm increases the risk of coordination problems, but it reduces the administrative burden on the client for managing the survey administration, especially if the survey is administered in-person.

I recommend the client consider the following when deciding whether or not to hire a survey research firm: (1) The human capital resources available to coordinate and administer the CV survey, and (2) the in-house knowledge of interacting with potential survey respondents with different backgrounds across different geographical regions in Lebanon. The table below offers guidance on whether or not to hire a survey research firm, taking into account the two aforementioned considerations.

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Consideration #1</th>
<th>Consideration #2</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario #1</td>
<td>High</td>
<td>High</td>
<td>In-house implementation</td>
</tr>
<tr>
<td>Scenario #2</td>
<td>Low</td>
<td>High</td>
<td>Hire short term resources or Hire</td>
</tr>
<tr>
<td>Scenario #3</td>
<td>High</td>
<td>Low</td>
<td>survey research firm</td>
</tr>
<tr>
<td>Scenario #4</td>
<td>Low</td>
<td>Low</td>
<td>Hire survey research firm</td>
</tr>
</tbody>
</table>

If the client decides to hire a survey research firm, I recommend setting at minimum the following criteria obtained from DeShazo et al. (2015) when selecting a survey research firm: (1) experience with statistical sampling and survey administration, including valuation surveys, (2) knowledge and training in economics, including environmental economics, and (3) cost. In addition, the client should consider the capabilities of the survey research firm in conducting survey pretests as well as selecting and training interviewers. The previous two considerations are discussed further in Step 10 and Step 11.3, respectively.

Step 6 Design the information component of the survey instrument

This step focuses on the information given to respondents in the CV survey instrument. The information component of the survey instrument involves choices such as which wording or illustrations to include for describing both the forest conditions and the biomass harvesting plan and what payment vehicle to present to respondents as the method of payment to be retrieved from them.

Any confusion or ambiguity arising from the description of the condition changes and provision mechanism may lead to the valuation of a good other than the one intended.

The information component is also referred to as the CV scenario or hypothetical scenario presented to respondents. Within this context, I will also use the term ‘program valuation scenario’ to refer to the information component.
Step 6.1 Describe the item to be valued

This step involves informing respondents on what is being valued and presents the change in forest and developmental quantity or quality conditions to be valued. The information set should include, at a minimum, the description of the program being valued, the current conditions of the attributes the program impacts, and the new conditions of the attributes after the implementation of the biomass harvesting program. This step does not require an extensive, comprehensive valuation scenario, but a scenario that is clear enough for respondents to understand the change they are being asked to value. As mentioned in Step 1, when considering the degree of program impacts, subject matter experts should be consulted for an accurate description.

The information is typically presented in either written or verbal form, depending on the data collection method chosen, and is accompanied by graphs, pictures, and other visual information to help facilitate a respondent’s understanding. Recent advances in simulated images and geographic information system data have improved the realism of the information in CV scenarios to respondents (Champ et al., 2017).

One key consideration in constructing the scenario involves drafting an information scenario that provides a neutral description of the change to be valued. The information scenario should not be constructed in a manner using certain sales pitch language to attempt to influence a respondent’s behavior towards the change being valued.

Overall, this step requires the optimal selection of information that clearly explains the change to be valued to respondents by accounting for the heterogeneity in how respondents process information.

I recommend the use of pretesting procedures, refer to Step 10, such as focus groups to help refine how to present information effectively (i.e. using graphs) and how much detailed information should be provided to respondents. The goal is to have the majority of different respondents clearly understand the change to be valued using the information presented to them.

Step 6.2 Select a provision mechanism

The provision mechanism is the process that will lead to the change that respondents are being asked to value. In this context, the provision mechanism has already been established through the biomass harvesting plan proposed for Andket forest.

Determining the entity involved in carrying out the provision mechanism is also a crucial component. For example, a local municipality might be the entity considered in carrying out the program.

I recommend the use of pretests, as described in Step 10, to ensure that the description of the provision mechanism is perceived as being credible and understandable by respondents. In addition, I recommend specifically pretesting for a respondent’s reaction towards the entity involved in carrying out the program. Governmental entities responsible for implementing the program might be unfavorable to most respondents resulting in biased value estimates on the benefits of the program.
Step 6.3 Select a payment vehicle

The payment vehicle is the mode of payment respondents are being asked to consider when answering the elicitation question. In other words, the payment vehicle informs respondents on how payments would be made. For example, the payment vehicle may be a property tax increase to fund the biomass harvesting program.

The choice of payment vehicle involves the factors of realism and mitigating payment vehicle rejection in order to increase survey reliability and decrease the hypothetical bias of a CV.

Payment Vehicle Realism

The selection of a payment vehicle should be construed as both possible and appropriate by respondents to ensure it dovetails seamlessly with the CV scenario and is taken as a serious implementable payment in the future. For instance, a sales tax would not be a credible payment vehicle in an area that does not have a sales tax or when the entity providing the program being valued does not have any taxing authority. So a respondent may reject the valuation scenario even if they value the change in environmental and developmental conditions on account of not believing the payment mechanism is credible (Champ et al., 2017).

Another factor of realism is the alignment of the payment vehicle with the value to be estimated. For instance, using an increase in water utility fee rates to estimate the passive use value of ground-water may not be logical to respondents.

Common payment vehicles include tax vehicles, voluntary donation vehicles, utility fee vehicles (i.e. electricity bill, water bill, etc.) and entrance fee vehicles for environmental enclosures. In a more specific scenario context, payment vehicle examples could be described as follows:

1) An increase in water utility bills for programs that protect ground water, and
2) An increase in entrance fees at national parks for programs that protect the forest’s biodiversity.

Payment Vehicle Rejection

On the other hand, payment vehicle rejection arises from respondents who value the program but disclose a valuation response of $0 due to not favoring the payment vehicle. For instance, income tax vehicles may be unfavorable to respondents who dislike taxes or have a distrust over the government’s use of the taxes. Donation payment vehicles may lead to an underestimate of value because the payment vehicle may not be incentive compatible for eliciting a respondent’s full WTP and they invite free-rider problems (Wiser, 2007; Carson, R. & Groves, T., 2007).

For the results of studies comparing specific payment vehicles, refer to Appendix C.
Payment Vehicle Selection

The selection of payment vehicles is often study-specific and will always require careful pretesting to understand how respondents view the payment vehicle. In certain CV studies that deal with unfamiliar goods, such as biodiversity protection or prevention of climate change, the payment vehicle of voluntary contribution or taxes could be a source of hypothetical and other biases (Pattanayak et al., 2007). Tax payment vehicles in developing countries are often not reliable because compliance might often be low (Whittington, 2010).

One main payment vehicle strategy stated preference researchers employ in developing countries is using surcharges on water or electricity bills since they are the only credible revenue collection mechanisms in operations (Whittington, 2010). Using surcharges on utility bills has the advantage of framing a respondent’s payment as both mandatory and periodic. This is not the case for voluntary donations.

A variety of payment vehicles, besides taxes and voluntary donations, that have been used in forest program studies are presented in the table below.

Table #6: Payment Vehicles Used in Similar Contingent Valuation Studies

<table>
<thead>
<tr>
<th>Payment Vehicle Description</th>
<th>Study Context Description</th>
<th>Study Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surcharge on household’s monthly water bill</td>
<td>Valuing a forest protection program against logging and poaching; Module 1.</td>
<td>DeShazo et al. (2015)</td>
</tr>
<tr>
<td>Annual surcharge per household on electricity consumption (a surcharge included in the electricity bill) designed to finance a fund</td>
<td>Valuing a forest biomass program</td>
<td>Solino, M., Prada, A. &amp; Vazquez, M. (2010)</td>
</tr>
<tr>
<td>Surcharge on household’s monthly electricity bill with funds collected and spent by either the government or private electricity supplier on renewable energy projects(^5)</td>
<td>Valuing the WTP for renewable energy under collective and voluntary payment vehicles, and under government and private provision of the good.</td>
<td>Wiser (2007)</td>
</tr>
</tbody>
</table>

\(^5\) Wiser (2007) tested four specific provision contexts in which I mentioned only two with the difference being the entity which collects the additional funds. The other two payments have to do with voluntary increases in a household’s electricity bill.
<table>
<thead>
<tr>
<th>No payment vehicle identified (i.e. Is your household willing to pay X amount annually?)[6]</th>
<th>Valuing WTP for the preservation of forest biodiversity</th>
<th>Garcia, S., Harou, P., Montagne, C. &amp; Stenger, A. (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents answered that the best method of payment for forest conservation would be a fixed amount retrieved from amenity services or through the establishment of a forest trust fund</td>
<td>Valuing WTP for the conservation and sustainable use of the cedar forests in Lebanon</td>
<td>Sattout, E.J., Talhouk, S.N. &amp; Caligari, P.D. (2007).</td>
</tr>
</tbody>
</table>

I recommend the consideration of the following payment vehicles noted in Table #6 above and the avoidance of tax or voluntary payment vehicles in a developing country like Lebanon. An entrance fee payment vehicle for environmental enclosures is not applicable for testing non-use values, specifically for respondents who have not visited or have no intention of visiting Andket forest. Furthermore, I recommend that the selection of a payment vehicle is determined through pretesting how respondents react and view the different payment vehicle options. If multiple payment vehicles are selected for use, I recommend testing for payment vehicle bias when analyzing the results of the administered CV instrument. For one approach to payment vehicle bias testing refer to the payment vehicle section in Step 9.1.

Such questions that could be asked during pretesting to determine the validity of the payment vehicle include, but not limited to, the following:

1) How do you think the money for the biomass harvesting program will most likely be collected? (Offers what payment vehicle respondents may find most plausible).
2) Do you think the entity responsible of collecting payment is effective?
3) Do you think the vehicle is an appropriate means of payment?


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6 The authors decided that a unique payment vehicle would not increase the studies reliability and may increase protest responses due to a respondent’s cultural preference towards any authority or a heterogeneous mixture of economic and noneconomic instruments used different regions of the affected population (inadequate coverage of a single unique payment vehicle).
Step 6.4 Select a decision rule

The decision rule is the rule that establishes what response or response threshold provided by respondents will inform whether the item valued will be provided. For example, a decision rule could be that the biomass harvesting program will be provided if at least 50% of respondents answer “yes” to a dichotomous-choice question.

A referendum decision rule, majority rules, is applicable when the issue is related to the provision of a public good and the payment vehicle is an increase in taxes or utility rates. However, a referendum is not applicable when attempting to valuate use values, such as recreational activities, and the payment vehicle is the increase in trip costs. In this case an appropriate decision rule may be to implement the program if the aggregate benefits, determined through the respondents’ valuation responses, exceeds the project’s cost.

Overall the selection of the decision rule should help increase the consequentially and realism of the CV scenario to evoke a truthful valuation response from respondents. Furthermore, the decision rule must be linked to the payment vehicle and the format chosen of the valuation question set out in Step 7 below.

I recommend the use of a referendum decision rule since the client is dealing with the valuation of an unfamiliar good, inclusive to assessing a forest’s non-use values. Please note that the selection of the referendum decision rule is appropriate for a dichotomous choice question but is not appropriate for an open-ended question; refer to Step 7 below. In addition, a referendum decision rule is seen as consequential by respondents. For additional description on a CV scenario’s consequentiality, in particular for a referendum vote, refer to Step 8.

Step 6.5 Select a time frame of payment

This step involves the number and frequency of payments respondents will be asked to make in the CV scenario. The time frame of payments may range from, but not limited to, a one-time payment, monthly payments, or as annual payments over the time horizon of the biomass harvesting program, if applicable.

The time frame of payments is important because it affects how value estimates are aggregated to calculate benefits. One-time payments are an issue in developing countries where most respondents have a high rate of time preference and prefer not to make a one-time lump sum payment (Poulos, C & Whittington, D., 2000). Also, one time payments may be an issue since most respondents may be willing to pay for the program in small payments overtime but not in one lump sum payment if they happen to have low liquidity. However, the benefit of using a lump sum payment is the ease in calculating value estimates. A one lump sum payment automatically provides a present value estimate of the item being valued. Whereas, periodic payments over the time horizon of the biomass harvesting program have to be discounted back to obtain the present value of the program. Selecting an appropriate discount rate to discount future payments could be quite difficult.

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7 A dichotomous-choice question is a format of the contingent valuation question eliciting the respondent’s WTP (Refer to Step 7).
Table #7: Time Frame of Payment Comparison

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>One-time Payment</th>
<th>Periodic Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount rate required to calculate aggregated value estimates?</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Compatibility in developing countries with low incomes and low liquidity</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

I recommend that the time frame of payment is inextricably linked to the payment vehicle selected to ensure credibility; preferably the time frame of payment is periodical and lasts as long as the time horizon of the program. For example, if an increase in water utility fees is chosen as a payment vehicle, the time frame of payment should be the actual frequency respondents pay such utility fees. A periodical time frame of payment is more compatible in developing countries with low incomes and liquidity. Also, I recommend conducting a sensitivity test to assess the sensitivity of aggregate value estimates to changes in the discount rate.

Furthermore, I recommend that the time frame payment feature is carefully addressed through pretesting, refer to Step 10.

Step 6.6 Include substitutes and budget constraint reminders

This step involves reminding respondents to consider substitutes, other items they may purchase with their money, and think about their budget constraints, their available income, when answering contingent valuation question. Both the availability of substitutes and income affect the magnitude of welfare estimates (Champ et al., 2017).

Studies have revealed that reminding respondents of the availability of substitutes, complements, and their budget constraint could affect the estimates of central tendency and dispersion (Kotchen, M. & Reiling, S., 1999).

I recommend placing a written reminder in the survey for the respondent or interviewer, depending on the selected data collection mode, to prompt respondents to consider likely substitutes they could spend their money on and to think about their budget constraints. Furthermore, I recommend that the reminder statement is carefully addressed through pretesting, refer to Step 10.

Step 7 Design the contingent-valuation question

This section involves guidelines for selecting and designing a contingent valuation question to reveal information about the value respondents place on the program through its impacts described in the valuation scenario.
Step 7.1 Select a response format

The response format refers to how the value elicitation question will be answered. Selecting the appropriate response format has implications on how the response data can be analyzed and interpreted.

Also, the selection of the response format should be congruent with the decision rule selected above in Step 6.4. A majority vote would work with a dichotomous-choice response format but not with an open-ended response format (Champ et al., 2017).

The following are the three main response formats:

1) Open-ended: Respondents are asked to directly provide their maximum WTP
2) Payment-card: Respondents are asked to choose an amount from a list of WTP amounts
3) Dichotomous-choice: Respondents are asked to respond “yes” or “no” to a specified dollar amount

Open-ended response format

An open ended question asks respondents how much they would pay for the specified change. The following is an example of an open-ended response format:

*If passage of the proposal would cost you some amount of money every year for the foreseeable future, what is the highest amount that you would pay annually and still vote for the program? (WRITE IN THE HIGHEST DOLLAR AMOUNT AT WHICH YOU WOULD STILL VOTE FOR THE PROGRAM)*


An even more well-defined question would tell respondents the period over which payments would occur.

Responses to an open-ended question result in a continuous distribution of responses over the interval [0, Infinity].

Payment-card response format

A payment card response format offers n WTP amounts to respondents, who are then asked to identify their maximum WTP for the good or service.
The following is an example of a payment card response format:

*If the passage of the proposal would cost you these amounts every year for the foreseeable future, what is the highest amount you would pay and still vote for the program? (CIRCLE THE HIGHEST AMOUNT THAT YOU WOULD STILL VOTE FOR THE PROGRAM)*

<table>
<thead>
<tr>
<th>10¢</th>
<th>50¢</th>
<th>$1</th>
<th>$5</th>
<th>$10</th>
<th>$20</th>
</tr>
</thead>
<tbody>
<tr>
<td>$30</td>
<td>$40</td>
<td>$50</td>
<td>$75</td>
<td>$100</td>
<td>$150</td>
</tr>
<tr>
<td>$200</td>
<td>MORE THAN $200</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Responses to a payment-card question reveal whether the respondent’s value lies between the payment intervals of the payment card \([\text{Circled Bid Amount} < \text{WTP} < \text{Next Highest Bid Amount}]\).

Dichotomous choice response format

The dichotomous choice response format asks respondents if they would pay $X amount for a specific change.

The following is an example of a dichotomous choice response format framed as a referendum vote:

Would you vote for this proposal if the proposal would cost you $B every year for the foreseeable future? (CIRCLE ONE NUMBER)

1 Yes
2 No


The bid amount $B is varied over different respondents. Responses to a dichotomous choice question only reveal if a respondent’s value is greater than, “yes” response, or less than, “no” response, the bid amount they received. If the respondent answered “no” to bid amount $B their WTP value lies below \([0, B)\). Whereas, if a respondent answered “yes” their value lies above \([B, \infty)\).

The above example is one variation of the dichotomous-choice format known as the single bounded question. Other variations present more follow-up bids to respondents. For example, a double bound dichotomous choice question involves presenting respondents with an additional iterative higher bid if they answer “yes” to the initial bid or an additional iterative lower bid if they answer “no” to the initial bid; refer to the Figure #1 below for an illustrative example.
Where $A$ is the initial bid amount, $BH$ is a higher dollar amount, typically an increase by a factor of 2, from the initial bid, and $BL$ is a lower dollar amount, typically a decrease by a factor 2, from the initial bid.

In the double bounded dichotomous choice question there are four possible outcomes:

1) [Yes; Yes] in which WTP > $BH$
2) [Yes; No] in which $A < WTP < BH$
3) [No; Yes] in which $BL < WTP < A$
4) [No; No] in which WTP < $BH$

As you may infer from the above, a double dichotomous model leads to interval data obtained from the binary variable responses.

For additional information on variations of the dichotomous-choice question such as one-and-one-half bounded questions and multiple bounded questions please refer to Cooper, J. C., Hanemann, M. & Signorello, G. (2002), Hanemann, W. M., Loomis, J. & Kanninen, B. (1991), and Bateman et al. (2001); respectively.
Additional design features of payment cards and dichotomous choice

In closed-ended elicitation formats, such as the dichotomous choice method, and payment-card questions, the selection of an appropriate bid distribution should be considered. To facilitate the econometric modeling of the valuation responses, a range of values/bids is presented to different households.

Champ et al. (2017) offers the following three-step process in the development of bid values:

1) Review similar studies in the literature to develop prior information
2) Use prior information to develop initial bid amounts for pretesting the survey instrument and adjusting the bid amounts based on pretesting results
3) Use an optimal bid-design approach to select the bid amounts used in the final survey instrument

With respect to the third step above in the three-step process, an optimal bid design has a small number of bids, typically four to eight bids, and the bid amounts should span the median WTP (Champ et al., 2017). Any misspecification of the bid distribution leading to bid amounts that fall below or above the median compromises the ability to estimate mean WTP.

In deciding the range of bids, Pattanayak et al. (2007) lists the following factors that need to be considered:

1) The range of bids should be realistically close to the actual costs and current bills of the payment vehicle
2) The range of the bid should be sufficiently wide to assess demand and to capture relevant policy alternatives

A rule of thumb is that the lowest bid is accepted by most of the respondents, while the highest bid is rejected by most of the respondents (Whittington, 1998). Pattanayak et al. (2007) offers the following example of an appropriate bid distribution for a consumption charge: the highest monthly consumption charge is a price that will be rejected by 90-95% of respondents, and the lowest charge is a price that will be accepted by 90-95% of respondents.

More variations in the bids require larger sample size, thus the number of bids included in the study is usually a factor of the study budget and logistical challenges during survey implementation (Pattanayak et al., 2007).


Response format comparison

The dichotomous choice method is the most frequently recommend choice method by researchers (Pattanayak et al., 2006). The “take-it-or-leave-it” nature of dichotomous-choice, when framed as a vote, has desirable properties for incentive compatible revelation of preferences (Carson, R. T., & Groves, T.,2007; Carson, R. T., Groves, T. & List, J. A, 2014; Hoehn, J. P. & Randall, A., 1987). Respondents have no incentive to pick high or low willingness to pay amounts to purposely misstate their values when there is a single bid
amount. This is not the case for open-ended or payment card response formats. In addition, the NOAA panel recommended the use of the referendum format; a decision rule often associated with the dichotomous choice response format (Portney, 1994).

Although the dichotomous-choice method is the most commonly used, each of the response formats has strengths and weaknesses; refer to the table below.

**Table #8: Comparison of contingent-valuation response formats**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Open-ended</th>
<th>Payment card</th>
<th>Dichotomous choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentive compatible</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Bid design required</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Responses/statistical efficiency</td>
<td>Continuous</td>
<td>Interval</td>
<td>Greater than or less than a threshold bid</td>
</tr>
<tr>
<td>Potential problems</td>
<td>Zero bids</td>
<td>Anchoring</td>
<td>Anchoring</td>
</tr>
</tbody>
</table>

Source: Champ et al., 2017, p.105

For an additional summary on the strengths and weaknesses of response formats and other response format variations, refer to Appendix D.

Although an open-ended question may provide a mean WTP estimate without the use of extensive econometric modeling analysis, it places an undue burden on respondents to value a new commodity without being offered a price choice like other goods in the market. Such a high information complexity may lead to unrealistic responses. On the other hand, a dichotomous choice format, unlike an open-ended or payment card format, mimics the decisions individuals make in the market. Although a dichotomous response format may be seen to lack efficiency, its variant, the double bounded dichotomous model, has been proven to be more efficient through empirical and theoretical evidence (Hanemann et al., 1991).

According to Haab, T.C. & McConnell, K.E. (2002), double bounded models increase efficiency of single dichotomous choice models in three ways:

1. Answer sequences of yes-no or no-yes provides clear bounds on WTP
2. Answer sequences of yes-yes or no-no further constrain part of the distribution of where the Respondent’s WTP can lie
3. The number of responses is increased, so that a given function is fitted with more observations (statistically the number of observations is not doubled since the responses from a single individual are correlated).

Adding an additional bid iteration, such as in a triple bound dichotomous choice model, produces only a relatively small gain in efficiency and increases the risk of inconsistent responses with prior bid responses (Yoo, S. & Yang, H., 2001).
I recommend the selection of the double bounded dichotomous-choice response format posed as a referendum vote. In addition, I recommend the use of pretesting procedures, refer to Step 10, such as focus groups to help determine an appropriate range of bid values. Also, if sample size is a major constraint, I recommend effectively designing a bid design for five bids which will reduce the requirement for a large sample size while ensuring an optimal number of bids. According to Alberini (1995a,b) and Kanninen (1993a,b,1995) an optimal design involves a small number of bids, typically four to eight, and the bid amounts should span the median WTP, and not be placed close to the median or to the tails of the distribution. The sample size should be distributed evenly to each bid.

Step 7.2 Allow for value of $0

This step considers the respondents who hold values of $0. Such respondents need a way to indicate a lack of value for the change in conditions brought upon by the biomass harvesting program.

With an open ended question, respondents can enter a value of $0, whereas a payment card question may include a value of $0 for respondents to circle.

In addition to my dichotomous-choice question recommendation, I recommend adding up a follow up-question to respondents who answer “no” to the valuation question if they would “pay anything” for the change.

An alternative approach the client may consider is the addition of a $0-value screen question before the contingent-valuation question. In such a case, the client should administer the valuation question only to the respondents who answer “yes” to the screen. A sample of such a question within the client’s context may be “Would you vote for the proposed biomass harvesting plan if passage of the plan would increase your household’s [insert payment vehicle chose]?” Respondents who answer “no” to the previous question should not be asked the contingent-valuation question.

Step 7.3 Address protest and other types of misleading responses

This step involves the consideration of potential misleading and protest responses which include the following types of response categories:

1) Respondents who protest some component of the contingent valuation scenario (i.e. payment vehicle) and provide an answer of $0 even though they might value the item
2) Respondents who provide a value estimate but have not quite fully understood what they are being asked to value
3) Respondents who behave strategically with an underlying incentive to overstate or understate their values in an attempt to influence survey results and the decision
To address the abovementioned misleading or pretest responses, a CV study design should consider investigating the presence of data outliers, including questions to differentiate true $0 responses from protest $0 responses and include questions to probe the respondent’s acceptance of the payment vehicle, time frame of payment, and/or the provision mechanism.

For examples of attributes of a CV study design that mitigate or detect potential misleading or protest responses, refer to interviewer training in Step 11.3 or debriefing questions in Step 9.

Other types of bias and validity threats are discussed in the next step below; Step 8.

**Step 8 Consider threats to CV study validity**

When designing the survey instrument, Step 10, engaging in pretesting procedures, Step 11, administering the survey, Step 12, and analyzing the survey results, Step 13, the client needs to consider and address the possible validity threats and biases that may affect the robustness of the CV study. If errors and biases are discovered during survey administration, it may compromise the whole study and a new random sample of respondents may be required to begin once more.

The common issues that may affect the robustness of a CV survey are categorized within generic survey issues or CV specific issues.

**Generic Survey Issues**

Potential sources of error relevant in all survey contexts involve biases arising from the way the sample was selected, questions were framed, and the way the survey was conducted (Pattanayak et al., 2007). The potential sources of error that can arise during the survey process is best encapsulated through the following figure presented below.
Figure #2: Potential Sources of Error during the Survey Process

Coverage Error: Not all members of the affected population have a known nonzero chance of being asked to complete the survey

Sampling Error: Sample is not representative of the population

Nonresponse Error: Individuals selected through the sampling framework may not respond to the CV questions.

Measurement Error: Responses to a survey question do not accurately reflect the underlying desired measure

Source: Champ et al., 2017, p.59

For a further description on additional types of errors and biases that might arise from generic survey issues, refer to Champ et al. (2017) and Groves et al. (2009).

CV Specific Issues

According to DeShazo et al. (2015), Carson, R. T., & Groves, T. (2007), Arrow et al. (1993) Kling, C.L., Phaneuf, D.J. & Zhao, J. (2012), the primary threats to validity revolve around the following five issues:

(1) Respondents not understanding the main purpose of the survey and what they are being asked to value;

(2) Respondents not viewing the survey as consequential enough to lead to an actual policy decision or implementation;

(3) Respondents not facing a coercive payment vehicle that introduces the consequentiality of payment if the policy is enacted;

(4) Respondents not considering their budget constraints before making a decision on the amount they are willing to pay; and

(5) Survey administration procedures that may bias the preferences of respondents before eliciting their WTP.
Refer to Appendix E for required measures to minimize and avoid additional potential biases inclusive to the biases referenced above. For additional insights with respect to study designs that reduce bias in central tendency measurement, refer to Mitchell and Carson (1989).

I recommend considering all the possible potential biases and threats to the CV study validity when designing and administering the survey instrument. Also, I recommend referring to step 12.3 on ensuring CV accuracy through conducting validity tests.

When I offered my guidance and recommendations for the remaining CV steps below, I took into consideration the possible validity threats and biases mentioned above.

Step 9 Design the survey instrument

Step 9.1 Outlining and Drafting the CV Instrument

The outline and format of each CV survey instrument is dependent on the context of the program valuation. As a result, there is no predetermined standard template which suits CV studies addressing multiple types of program valuations.

Although there is no common recommended content for a CV survey instrument, Pattanayak et al. (2006) provides guidance on the sections a CV survey instrument should generally have. The table below summarizes the content a CV survey should generally have as per Pattanayak et al. (2006), along with the respective order of the content.

Table #9: CV Instrument Content Outline

<table>
<thead>
<tr>
<th>Order</th>
<th>Content Section</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
</tr>
<tr>
<td>2</td>
<td>Description of the Good to be Valued</td>
</tr>
<tr>
<td>3</td>
<td>Institutional Setting</td>
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<tr>
<td>4</td>
<td>Payment Vehicle</td>
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<tr>
<td>5</td>
<td>WTP Elicitation</td>
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<td>6</td>
<td>Debriefing Questions</td>
</tr>
<tr>
<td>7</td>
<td>Socioeconomic Profile</td>
</tr>
</tbody>
</table>

Appendix F offers a sample CV survey instrument incorporating the CV instrument recommendations and information component described above. The ordering and outline of the sections follow the section order presented in Table #9 above. I wrote the draft survey in line with my recommended survey administration procedure of in-person. Thus the wording of the survey is meant to be read by an interviewer, it is not written to be a self-administered survey.

As a caveat, any opinion questions asked of respondents, such as a question asking respondents to rate the current condition of the program’s non-marketed benefits being valued, should be placed before the valuation question in the survey. The placement of such opinion questions after the valuation question nullifies the assumption that the responses to the opinion questions are exogenous to the responses of the valuation question (Champ et al, 2017). However, ensure such opinion questions are neutrally worded as to avoid influencing the respondent’s valuation decision.
The remainder of Step 9.1 offers a description of each of the seven content sections and provides the decision process used in drafting the survey in Appendix F.

Introduction

The introduction should provide a description of the survey background and purpose.

Pattanayak et al. (2007) notes the following objectives of the introduction section: (1) explaining the purpose of the survey, (2) seeking consent of respondents for the interview, (3) instructing respondents on the interview procedure, (4) ensuring survey compliance with law, specifically with regards to ensuring to respondents the confidentiality of responses, (5) unit level of measurement identification number, such as a household identification number along with a cluster identification number if cluster sampling used, and (6) contact address for follow-up information. The items above are generally included in a cover sheet before any question is asked or additional information on the good to be valued is given.

I recommend addressing the validity issue concerning how respondents view the consequentiality of the CV study, refer to Step 9, in the introduction section. For example, in a discrete choice experiment valuing tropical forests, DeShazo et al. (2015) included a statement on the cover sheet informing respondents that the survey respondents might affect how the forests will be managed since the findings will be shared with the respective government agencies.

In addition, I recommend specifically pretesting, refer to Step 11, for any possible adverse reactions respondents may have when disclosing who is conducting the survey or who is going to implement the proposed biomass harvesting plan.

Finally, an important aspect of the introduction, in reference to objective number four (4) noted by Pattanayak et al. (2007) above, is disclosing to respondents that their responses and contact information will be treated as confidential. This is important since the respondent will be asked questions on sensitive topics such as their socioeconomic information and/or perceptions of the efficiency of the government or respective agency in implementing the proposed biomass harvesting plan.

Again, it is always recommended to conduct a pretest on any CV survey component used before drafting and implementing the final survey. Especially since the introduction section includes a brief introduction on the entity in charge of carrying out the survey, such as the United Nations Development Programme, and the entity in charge of carrying out the biomass harvesting program, such as the local municipality or government. Pretesting should gauge whether or not respondents will protest the survey or give biased value estimates in rejection of the entity in charge of carrying out the biomass harvesting program or the entity in charge of administering the CV survey.
Description of the Good to be Valued

In describing the item to be valued, I will rely on best practices described in a known CV study on the 1989 Exxon Valdez oil spill in the United States (Mitchell, 2002). In addition, I will rely on the CV methodological guidelines issued by the Blue Ribbon Panel\(^8\) (Arrow et al., 1993). Most of all I will be relying on the scenario insights and survey format used in a household survey for valuing protection and recreations use of tropical rainforests in Peninsular Malaysia (DeShazo et al., 2015).

UNDP CEDRO (2016) was the main source used to construct the description of the good to be valued. Other additional sources used for guidance in constructing what benefits to portray for a forest program include Tabatabaei, M., Loomis, J.B. & McCollum, D.W. (2015) and Solino, M., Prada, A. & Vazquez, M. (2010).

The draft survey does not include an exhaustive list of forest goods and services impacted by forest fires such as the impacts on flora and fauna biodiversity, recreational activities, tourism and scenic beauty.

Most importantly, the draft survey did not take into consideration any regulations that might impact the likelihood of the program’s implementation or the time horizon of the program or the benefits. Also, the only activities described in carrying out the program, within the draft survey, was the pruning and thinning of vegetation. If there is any other type of activity necessary to carry out the program that impacts the forest, such as the construction of a road through the forest, it should be included within the CV instrument. Not only should such an activity be included, it should also include a description of the activity’s environmental impact relative to the status quo condition of the forest, even if the impact is a negative effect.

I recommend referring to Solino, M., Prada, A. & Vazquez, M. (2009) for a good overview on the environmental and economic impacts of a biomass harvesting program. Refer to Appendix G for a brief overview of the external effects of a biomass harvesting program. In addition, any impacts included within the CV instrument should be validated by environmental experts in Lebanon.

Also, I recommend conducting a focus group to identify and understand the participants’ concern about forest management in Lebanon, the usefulness of different types of graphics, and the terms used in the survey that need further clarification.

Institutional Setting

The institutional setting refers to the entity or organizations that are in charge of implementing the biomass harvesting program. This CV survey content specifically refers to Step 6.2 discussed above.

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\(^8\) The Blue Ribbon Panel, composed of world renowned economists of which three are Nobel laureates, was convened in 1992 by the National Oceanic and Atmospheric Association (NOAA) to advise on the reliability of contingent valuation in measuring lost passive-use values of damages (Mitchell, 2002).
For the purpose of the draft survey, the Association for Forests, Development and Conservation (AFDC) along with the local municipality of Andket will be responsible for carrying out the program.

Also, as seen in the introduction section of the draft survey, government was mentioned to ensure the respondent sees the implementation as credible. In particular, the draft survey mentions the government as a whole to increase the realism that the payment vehicle, mentioned below, could be effectively implemented.

Again, it is always recommended to conduct a pretest on any CV survey component used before drafting and implementing the final survey.

Payment Vehicle

This section describes the way in which respondents will pay for the good. This CV survey content specifically refers to Step 6.3 discussed above.

For the purpose of the draft survey, the payment vehicle used is a monthly surcharge per household on water consumption designed to finance a fund. This is similar to the payment vehicle utilized in an environmental stated preference study by DeShazo et al. (2015).

The selection of the payment vehicle avoided the use of taxes which may lead to a high rejection by respondents in developing countries. However, to ensure the CV instrument is realistic the government as a whole is mentioned since any change in utility bills might require governmental authority.

As to avoid any type of rejection due to mentioning the government or respondents viewing the amenity services as inefficient, a fund is proposed to ensure any surcharge collected will be specifically routed to a fund associated with the program.

The payment vehicle selected utilizes the periodic time frame of payment which requires the use of a discount rate during data analysis to obtain the aggregated value estimate. In this draft survey, no time horizon is specified for the program. In such a case, the data analysis portion should value future payments as a perpetuity. A perpetuity is an annuity that receives an infinite amount of periodic payments under the assumption that the program has an indefinite time horizon. The present value of a perpetuity in deriving the aggregate value estimate can be calculated using the following formula:

\[
\text{Present Value of a Perpetuity} = \frac{\text{WTP}}{\text{Discount Rate}}
\]

Furthermore, in order to mitigate hypothetical bias, a screening question asking respondents whether or not they pay a monthly water bill is present in the draft survey. The purpose of inserting a screening question should be seen as a possible tool in dealing with the coverage of the selected payment vehicle. Depending on how respondents answer the screening question, the framing of the mode of payment could be possibly altered. Having multiple screening questions on what type of utility payments the respondent engages in could offer a dynamic approach to framing the mode of payment in the CV scenario. Please refer to the figure below for one possible dynamic approach that could be utilized for a CV instrument that poses two screening questions.
In reference to the figure above, for respondents who answered “yes” to both screening questions, it is recommended that those respondents be randomized into two groups. One group is subjected to the payment vehicle of electricity bills, while the other group is subjected to the payment vehicle of water bills. This randomization will allow the CV researcher to detect any possible protest or payment vehicle bias affecting the value estimates received from respondents. It could be that respondents who were offered electricity bills as the payment vehicle, on average, have lower WTP estimates relative to respondents who were offered water bills as the payment vehicle.

On the other hand, a conservative approach could be screening for only one payment vehicle, such as water utility bill, and deciding not to survey respondents who do not pay water utility bills.

Again, it is always recommended to conduct a pretest on any CV survey component used before drafting and implementing the final survey.

WTP Elicitation

This section poses the decision respondents need to make in order to retrieve their WTP.

In line with my recommendation in Step 7 above, I recommend presenting respondents with a double-bounded dichotomous choice elicitation question along with my recommendation of a referendum decision rule.

Cummings, R. G. & Taylor, L. O. (1998), Vossler, C. A., Doyon, M. & Rondeau, D. (2012), and Carson, R. T., Groves, T. & List, J. A. (2014) argued that dichotomous-choice questions should be accompanied by the realism that the referendum vote will be binding or at least have a nonzero probability of being used in the decision making process to provide the item being valued. For example, respondents must believe that the change will be implemented if
more than half of the respondents’ vote “yes.”

As a best practice, the question should contain the frequency of payments and allow respondents to provide a “no answer” or “I don’t know” option in addition to a “yes” or “no” answer when the question is framed as a referendum. This is in line with NOAA Panel recommendations (Arrow et al., 1993).

Debriefing Questions

This section poses questions to respondents about reasons for answering the way they did for the WTP elicitation question. Asking debriefing questions to respondents who answered “no” to the elicitation question is important.

Respondents who claim their answer is attributed to a lack of household income, should be no cause for concern. However, respondents who claim “I don’t know” as the reason for answering either “yes” or “no” on the elicitation question should be a cause of concern. Such cases may indicate that the information component of the CV instrument has not adequately described the scenario and the decision to be made by respondents. Such survey responses should be dropped or replaced appropriately.

In some cases, a “yes” answer may be followed with the respondent claiming they cannot afford the bill, in such cases the respondent decision should be interpreted as a “no” (Pattanayak et al., 2007).

It is crucial that the interviewer is trained in administering debriefing questions and interpreting the answers of respondents on the WTP elicitation question. Refer to my recommendation with respect to debriefing questions below in Step 11.

Socioeconomic Profile

This section focuses on obtaining social demographic and household economic information such as family size, income levels, number of members with incomes, and education. The section also offers an additional check of whether the survey is administered to the household head, refer to Step 11.1, and gathers the socioeconomic information of the respondent, such as age and gender.

Obtaining basic social demographic and household economic information is important for the following two reasons: (1) provides the necessary data to conduct validity tests such as a construct validity test described in Step 12.3 below, and (2) provides insights into policy formulation from determining which socioeconomic factors influence WTP values on improved forest conditions in Lebanon. In consideration of the sensitivity of the requested information of this section, it is often common practice to place such socioeconomic questions at the end of the survey. Respondents are more likely to respond and complete the questionnaire, inclusive to answering such sensitive socioeconomic questions, if they have already spent five to ten minutes answering the survey (Dillman, D. A., Smyth, J. D. & Christian, L. M., 2009).

Step 9.2 Translation

The sample CV survey instrument drafted only took into consideration the administration of the survey to respondents with a strong command of the English language.

In the case the English language CV survey version needs to be translated, the client should exercise caution. The translation of surveys to different language versions may lead to respondents having a different understanding of words and phrases used in the instrument. DeShazo et al. (2015) utilized the following approaches to mitigate any misinterpretation of the wording or phrasing when the survey instrument was translated: (1) Cognitive interviews to ensure respondents taking the survey in different languages had the same interpretations of wordings and phrasings, and (2) Reverse translation of a survey from English to another language and back to English to identify any issues with word choice. The use of reverse translation, according to DeShazo et al. (2015), led to simpler and more direct versions of the survey instrument in all the languages.

Overall, I recommend pretesting the CV survey instrument before survey administration; refer to Step 10 below.

Step 10 Pretest the CV Survey Instrument

Pretesting the CV survey instrument allows the client to check whether the wording and visualizations of the CV survey instrument communicates the information correctly to the respondent. A set of words or a question in a CV survey could often convey different meanings to respondents who generally differ in income, education, life experience and attention span during the survey (Mitchell, 2002). In order to construct a valid and robust CV study, the client must demonstrate that their CV design and wording maximizes a respondent’s understanding of the condition change, the biomass harvesting plan, how they are being asked to pay for the program (i.e. the payment vehicle) and the WTP choice.

Other considerations of pretesting the survey deal with testing for general survey issues such as question ordering and format.

There is no way after survey administration for the CV researcher to determine which respondents understood the good being valued and how it will be provided when they answer the WTP question. The CV researcher should understand how respondents interpret the CV instrument before administration to detect any sources of bias and unclear wording.

I strongly recommend conducting, at minimum, any of the following pretesting procedures before finalizing the CV survey instrument for administration:

1) Focus Groups

Focus groups are moderated discussions with small groups of people that obtain the participants’ perception of the good being valued and their reactions to different ways of presenting information (DeShazo et al., 2015). The individuals that make up the small group of people should be screened to have the desired mix of characteristics, such as age and work
status, that reflect the study population. Learning how different people in the focus groups interpret different features of the CV scenario is a crucial feature of this pretest. Responses to open-ended questions in focus groups can be coded in the survey instrument to facilitate the process of data entry and analysis.

DeShazo et al. (2015) utilized focus groups to identify and understand the concerns of participants regarding forest protection in Malaysia, terms used in the survey instrument that needed clarification, and the usefulness of different types of graphics that supported the survey text. Mitchel (2002) utilized focus groups in the Exxon Valdez contingent valuation to determine what people thought about the oil spill and its effects on natural resources, to test the use of taxes or higher gasoline prices as payment vehicles, and to determine whether having yearly payments over a five or ten-year span would be a consequential way to measure WTP.

Finally focus groups could lend preliminary insights into the selected bid distribution for closed-ended valuation questions such as the dichotomous-choice method.

2) Cognitive Interviews

Cognitive interviews involve members of the public working through the survey one-on-one with members of the research team. This will allow the respondent to walk through their thought process and identify, discuss and clarify issues as they arise in the survey instrument (Conrad, F., Blair, J. & Tracy, E., 1999).

In cognitive interviews, respondents are asked to give a verbal account of their thinking as they answer, concurrently, or immediately after they answer, retrospectively, a draft survey question (Conrad et al., 1999). These in-depth interviews aid the survey research team in determining the type of information a respondent requires before requesting it for answering the survey question. Unlike focus groups, cognitive interviews allow for a more in-depth probing of a potential respondent’s reaction in absence of group dynamics.

DeShazo et al. (2015) utilized cognitive interviews to determine that respondents taking the survey in different languages had the same understanding of the phrases and words used in the CV survey instrument.

3) Small Pretest

A small pretest involves interviewers using a draft survey instrument to interview a small number of respondents in the public selected at convenience. A convenience sample entails recruiting participants on the criteria of convenience, as opposed to having any particular characteristics related to the study population. Recruiting students from a class to participate in a survey is an example of a convenience sample.

A small pretest would allow the research team to get a quick idea of how the survey instrument works in the field. The main information obtained from pretesting comes from debriefing the interviewers. When debriefing interviewers, the research team should first solicit the general reaction of interviewers on what did or did not go well. Then the research team should go line by line in the survey instrument with the interviewer and learn where the wording worked or did not work for the survey respondents (Mitchel, 2002).
4) Large Pretest

A large pretest, also known as a pilot survey, is similar to a small pretest in obtaining relevant information with respect to the survey through debriefing interviewers. However, unlike a small pretest, a large pretest selects and interviews respondents based on the sampling method, data collection method, and survey administration procedures chosen; in reference to Step 2, Step 3, and Step 11, respectively.

The pilot survey is particularly useful in obtaining information on potential WTP values to be used to develop bids for dichotomous choice questions and payment-card. This ensures the range of bids chosen and placed in the surveys is appropriate and will provide credible results.

In brief, the pilot survey serves the following several purposes beyond what a small pretest offers:

1) Testing the survey sample (i.e. ensuring the sample frame attributes are current, contact information is up to date, and adequate to effectively implement the selected sampling procedure; refer to Step 2 above).

2) Providing information about the anticipated response rate, the expected final survey cost, and number of follow-ups needed.

3) Testing the effectiveness of the chosen survey administration procedures; refer to Step 11 below. The researcher can correct for any mistakes interviewers make in conducting the survey.

4) Providing meaningful information about the pattern of responses, particularly the likely WTP distribution, the distribution of responses to predictor variables, and whether WTP is related to the predictor variables. Obtaining information on the likely WTP distribution could help ensure a sufficient sample size is selected for the possible WTP variability in responses. Furthermore, information on the distribution of responses to predictor variable or the relation of WTP to predictor variables could help detect any possible shortcoming in construct validity; refer to Step 12.3.

I recommend at a minimum the survey materials are pretested using one of the pretesting procedures mentioned above. From the least to the most time consuming or costly, the pretesting procedures could be ordered as follows: (1) cognitive interviews, (2) focus groups, (3) small pretest, and (4) large pretest.

Any design or survey format decisions choices that arise from results of any pretesting procedures should be recorded adequately. Some decision choices may have implications on the value respondents attribute to the program’s non-marketed benefits being valued. For example, choice A of the survey design may enhance the attractiveness of the good to respondents. Whereas choice B of the survey design may reduce the attractiveness. Arrow et al. (1993) specifies that in situations where the appropriate design choice is uncertain, the CV survey researcher should pursue the conservative strategy. The conservative strategy is to opt for the design choice that is opposite to the survey sponsor’s interest to enhance the CV study’s validity.

If the client needs to choose between alternative design choices, I recommend the design choice that leads to a lower WTP amount be implemented.
**Step 11 Survey Administration**

This step involves the procedures required to properly administer the survey to the predetermined sample. The type of survey administration procedures involved vary according to the type of sampling methodology chosen, unit of measurement chosen and especially the type of data collection method chosen. For instance, the procedures for administering a survey using the Internet will involve the consideration of formatting the survey for the collection on different devices, such as a tablet computer or smart phone. Whereas the procedures for administering a survey using the mail will involve the preparation of survey packets, cover letters and purchasing postage.

I will discuss the survey administration procedures with respect to the recommended data collection mode above of in-person interviews.

**Step 11.1 Sampling unit interview procedure**

If the recommended sampling unit of household level is pursued, the appropriate sampling procedure is to interview any adult who claims to be the household head (Mitchell, R. & Carson, R., 1989).

Interviewers must be trained, preferably through a scripted response, in requesting for the household head; refer to Step 11.3 describing interviewer training below.

**Step 11.2 Contacting potential survey respondents**

Recruitment of survey respondents obtained from the random selection in the selected sample frame does not need to employ the same mode of administration as the final in-person survey.

Potential survey respondents could be contacted prior to the final survey implementation via email, mail, the telephone or in-person at their residence. The information provided in the sample frame, such as telephone number or address, should provide guidance on the options for contacting prospective survey respondents. Sometimes the invitation to complete the CV survey and the subsequent administration of the survey could be done together.

The client, along with the hired survey research firm if applicable, should decide on the best approach for contacting potential survey respondents and whether the survey should be administered along with the survey invitation.

**Step 11.3 Interviewer Training**

Inconsistent CV results are often the consequence of poorly trained interviewers and the resulting interviewer bias (Whittington, 2002). Hence it is crucial to ensure the survey experience of each respondent is standardized, as to avoid any inconsistent findings, by effectively training and managing the interviewers. Mitchell (2002) recommends that all interviewers follow a script in a neutral manner when they interview respondents in order minimize any form of interviewer bias.
I recommend the client draft a script to ensure each and every interviewer conduct a CV survey in a similar manner for all respondents. In the case the CV survey does not require an interviewer script dependent on the clarity, simplicity, and succinctness of the survey, I recommend the client train interviewers to read the CV instrument, as it is written. Interviewers should not compensate for poor CV wording, even if respondents request an additional explanation in the meaning of the text. Mitchell (2002) offers two reasons for this strict constraint placed on interviewers: (1) a resultant loss in survey implementation comparability if different interviewers convey different explanations and (2) an increased risk of interviewer bias arising from a personal interviewer element in spontaneous dialogue with respondents.

The client may consider the construction of a question and answer (Q&A) protocol. A Q&A protocol provides the interviewer with pre-specified responses to any anticipated questions that may arise. Through pretesting, the client may anticipate questions arising from respondents who need more information about an important aspect of the CV scenario but the client would not like to lengthen the scenario by adding wording that only addresses the concerns of a relatively small group of respondents.

I recommend engaging selected interviewers in any pretesting procedure selected in Step 10 above. It would be a great training exercise in familiarizing the interviewers with the content of the CV instrument and the possible reactions of respondents.

Pattanayak et al. (2007) offers the following sample training agenda for interviewers administering a CV survey:

1. Discuss the purpose of the study
2. Review the structure of the survey instrument
3. Illustrate how survey data will be used in the final analysis
4. Review the structure and purpose of the CV method
5. Explain the challenge of presenting hypothetical scenarios in a credible way
6. Conduct mock sessions in which [interviewers] administer the entire survey to each other
7. Explain ground rules of conducting CV surveys (Pattanayak et al., 2007, p. 20)

For item number seven (7) in the agenda above, refer to Appendix H.

I highly recommend that the client refer to Whittington (2002) for additional guidance notes on managing and training interviewers for CV surveys. The guidance notes Whittington (2002) discusses fall under the following themes: (1) selecting interviewers, (2) interviewer good practices, (3) interviewer training, (4) a sample schedule for a training program, (5) rewarding interviewers, and (6) field supervision.

For additional strategies on training interviewers to reduce bias and interviewer variance on responses refer to the chapter on survey interviewing in Groves et al. (2009).
In addition, I highly recommend, in reference to the objective of debriefing questions in Step 9 above, training interviewers to adequately interpret and record responses to the contingent valuation questions. This is especially important if interviewers are mostly getting “yes” responses to paying for the biomass harvesting program but failing to record that most respondents answer “yes” politely or follow the “yes” response with a condition by saying “yes, but” for instance. A respondent may answer “yes, but” to the valuation question when they actually mean “no.” Whittington (1998) provides details to how respondents mean “no” to the valuation decision, even if they start by answering “yes.” Making interviewers aware of recording such types of responses is crucial.

DeShazo et al. (2015), in line with recommendations from Whittington (2002), trained interviewers using a mix of on-the-job training, classroom training, and mock interview training. In selecting the pool of capable interviewers, DeShazo et al. (2015) applied screening criteria such as proficiency in the survey language, a minimum of 12 years of education, and a willingness to work during the evenings and weekends.

**Step 11.4 Survey Implementation**

*Field Supervision*

Field supervision is a quality assurance measure employed to enhance the quality of field work. The two main components of a field supervision involve the following:

1. **A detailed review of completed questionnaires**

   This component involves the review of an interviewer’s completed questionnaire soon after it has been administered. According to Whittington (2002), reviewing a questionnaire very soon after they are completed accomplishes the following things: (1) conveys to the interviewer that you are deeply interested in the information they are collecting and care about the quality of work they are doing, (2) enables the research team to identity problems with the questionnaire and quickly correct for them, (3) field supervisors could provide immediate feedback to interviewers keeping them engaged in the interview process to detect any inconsistent answers, and (4) field supervisors could standardize judgement calls on how to interpret a respondent’s answer to particular questions and thus prepare surveys for data entry.

   I recommend at least reviewing completed questionnaires at the end of each day for completeness and accuracy. If any errors or missing information is detected the interviewer should return to the household to correct for such errors or missing information.

   The client should make the decision on the extensiveness of the field supervision by taking into account the time and resources available.

2. **Assessing the quality of an interviewer’s performance**

   This gives the CV researcher or field supervisor the opportunity to detect whether or not interviewers are following the guidelines proposed in Step 11.3 above and in Appendix H.
Any serious problems detected with an interviewer’s work should be grounds for considering their termination since it may affect the validity of the responses given by respondents.

**Respondent Tracking**

A database should be established with information on the selected sample that facilitates the tracking of respondents and non-respondents. The database will offer a good measure on the progress of the survey administration.

In addition to tracking who responded, it is beneficial to track when an individual responded and if any follow up contact was made. This information could allow for the testing of differences between early and late respondents.

**Survey Timeline**

To ensure no exogenous impact on the responses of survey respondents brought upon by any short term events impacting Lebanon, I recommend the survey be completed all at once.

According to Pattanayak et al. (2007), the survey should be completed all at once and should not take longer than two to three weeks to complete.

**Step 12 Analyze data**

**Step 12.1 Priming the final data set**

Before any data analysis could be conducted, I recommend creating a useable data set especially in the case were the survey is administered in-person as opposed to electronically.

**Codebook**

This involves the translation of text responses into numerical responses. For instance, any questions eliciting a “yes” or “no” responses should be translated into such numeric values as “1” or “0” respectively.

<table>
<thead>
<tr>
<th>I recommend developing a codebook for the entire questionnaire that specifies variable names for each survey question. In addition, I recommend specifying the appropriate numerical code next to the response categories on each questionnaire. This would ensure no judgement in coding the data into certain numerical values.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>For any open ended responses, I recommend the client attempts to categorize the responses and code each open-ended response into the appropriate category. As mentioned above, conducting focus groups may help the CV research team pre-code responses to open-ended questions.</td>
<td></td>
</tr>
<tr>
<td>If the client decides to pursue the recommendation for a double bounded dichotomous choice response format, the coding could take one of the two following formats:</td>
<td></td>
</tr>
</tbody>
</table>
(1) Use two binary variables (i.e. R1 and R2) and two bid variables (i.e. Bid1 and Bid2), in which the two binary variables represent the response for the first and second bid (1 for yes and 0 for no) and the bid variables stores the bids presented to the respondents.

(2) Same as the first approach but supplants the binary variables with one categorical variables (i.e. responses) which denotes the four levels of possible responses (1 for yes-yes, 2 for yes-no, etc.)


**Data Entry and Processing**

In cases where surveys are not administered electronically, the data must be entered manually in an electronic database. The main risk of entering data manually is failing to enter the data correctly or skipping over questionnaire responses.

I recommend, if possible, setting up controls in the database to prevent any missing data entry points, responses that are out of range, and responses that are not the same data type as the responses for the respective question (i.e. should not have a character response data type under the database column of the respondent’s age) during data entry. One control may include not allowing the data enterer to proceed to the next question if the current question’s response is not filled out or out of the allowable range of potential responses.

Possible options for testing the accuracy of a completed data set against survey responses include the following: (1) Randomly comparing survey responses and the electronic database, or (2) enter the data twice and run a rudimentary computer check to see if the entry does not match the original data entry. Pattanyak et al. (2007) offers the following guidelines for option two above of entering the data twice: double enter 10% of the survey and double enter 100% of the critical survey sections such as the WTP elicitation response.

**Ethical Data Entry**

The identification numbers, not the respondents’ name or addresses, should be included in the final data set. This follows the disclaimer offered to respondents regarding the ethical responsibility of the interviewer to ensure the confidentiality of a respondent’s answers.

**Step 12.2 Preliminary analysis of the data**

**Ensuring Sample Representativeness**

If the objective of the CV study is to generalize the CV findings to a broader population, the socioeconomic variables from the respondents should be compared to Lebanon’s population.

In the case where the survey respondents differ from the broader population, I recommend the application of sample weights as the most cost effective solution.

**Calculating Descriptive Statistics**

Asides from estimating WTP estimates from the CV survey instrument, conducting additional calculations on variables present in a dataset offers the following two benefits: (1) additional data quality control and (2) policy relevant statistics.

Examining the descriptive statistics (i.e. mean, median, range, and standard deviation) of all the variables in the data set will allow the analyst to identify any anomalies, outliers or improbable values that require further investigation. In most cases the investigation requires tracing back the data point in question to a survey, to ensure values were inputted correctly. In extreme cases, the interviewer who administered the survey in question should contact the respondent once more for additional confirmation and/or clarification.

Furthermore, descriptive statistics may provide policy relevant statistics. Cross-tabulations by socioeconomic or geographic status should be calculated for all important variables including responses to the CV elicitation and environmental preference questions. This process will provide descriptive statistics on subpopulations which may be relevant to policy makers.

**Step 12.2 Calculating WTP**

The calculation of WTP values is dependent on the response format chosen. An open-ended response format may only require a simple regression or a multiple regression analysis, whereas a dichotomous choice response framed as a referendum would require either a probit or logit model to estimate WTP.

I recommend the client select a set of independent variables to obtain from the CV instrument to specify in the regression or econometric model chosen. Such independent variables should be selected based on economic theory. The independent variables may include the following:

1) Bids
2) Specific CV design components such as geographic area, if available
3) Socioeconomic variables
4) Forest and Environmental preferences

For further insights into the econometrics of non-market valuation refer to Haab, T.C. & McConnell, K.E. (2002).

For further insights into the study design of a double-bounded dichotomous choice model along with the required respective calculations, refer to Yoo, S. & Yang, H. (2001) and Aizaki, H., Nakatani, T. & Sato, K. (2015). In addition, I recommend referring to Aizaki, H., Nakatani, T. & Sato, K. (2015) for the calculation of a double bounded dichotomous choice model since the source created a package in R\(^9\), ‘DCchoice’, which adequately calculates data from a double bounded dichotomous choice CV instrument.

---

\(^9\) R is a free software environment for statistical computing and graphics
Step 12.3 Ensuring CV Accuracy

To ensure the robustness of the CV study, the client should evaluate the survey responses by undertaking the two tests: (1) Reliability and (2) Validity tests. The collective consideration of both reliability and validity constitutes what is considered a credible or accurate contingent-valuation study.

Reliability

Tests on reliability investigates the variance in WTP value estimates.

A common approach to investigating reliability involves repeating a CV study at two different points in time with the same individuals or different individual randomly selected from the same sample frame. However, the consensus in the CV literature supports the conclusion that CV estimates are reliable, thus reliability of CV estimates should not be a major concern (Champ et al., 2017). Also, it is important to note that values often change over time, so a failure to establish statistical equivalence in values over time does not discount the reliability of a study.

Validity

Tests on validity investigate whether a CV study accurately measures the value concept it is designed to estimate. Refer to the table below for a brief summary of the four main validity concepts.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Generic question</th>
<th>Specific question</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content validity</strong></td>
<td>Does the measure adequately cover the construct’s domain?</td>
<td>Does the estimate arise from the best study design practices—including scenario description, econometric analysis, elicitation format, follow up questions, etc.?</td>
</tr>
<tr>
<td><strong>Construct validity</strong></td>
<td>Does the measure correlate as expected to other measures as predicted by theory?</td>
<td>Does the estimate generated by a stated preference method relate to income, prices, and other variables in the way economic theory predicts?</td>
</tr>
<tr>
<td><strong>Criterion validity</strong></td>
<td>Does the measure relate favorably to other measures that are considered legitimate criteria (i.e., are believed to be accurate)?</td>
<td>Is the estimate generated by stated preference methods the same as a willingness-to-pay value that would be generated if real payment was made?</td>
</tr>
</tbody>
</table>

Table #10: Summary of Validity Concepts for Stated Preference Methods
In reference to the table above, the first three types of validity summarized are the most commonly investigated; content, construct, and criterion. In particular, convergent validity tests are not applicable within this context since they are not possible for passive use values. For additional insights with respect to validity testing, refer to Mitchel and Carson (1989), Champ et al. (2017), and Kling et al. (2012).

<table>
<thead>
<tr>
<th><strong>Convergent validity</strong></th>
<th>Does the measure correlate well with other measures of the same thing?</th>
<th>Is the estimate generated by a stated preference method the same as the willingness-to-pay value that is estimated from a revealed preference method?</th>
</tr>
</thead>
</table>

In reference to construct validity, WTP values are considered valid if explanatory variables show statistical significance in the hypothesized economic relationship with the dependent variable. Pattanayak et al. (2007) offers the following generally hypothesized relationships used to test the construct validity of responses to the elicitation question:

1) A positive and statistically significant coefficient for income which demonstrates positive income elasticity. The income elasticity of willingness to pay should be larger than one because environmental quality is best viewed as a luxury and/or normal good.
2) A negative and statistically significant coefficient for the bid and program charges which demonstrates negative price elasticity. The proportion of people willing to contribute to the environmental good should increase when the requested payment/bid decreases.

As a caveat with respect to the first (1) hypothesized relationship stated above, the income elasticity of WTP that is less than one could be consistent with an income elasticity of demand that is greater than one. This is attributed to the fact that the income elasticity of WTP for an environmental good depends on implied income elasticity of demand for the environmental good, the substitutability factor with other goods, and the share of income allocated to market goods (Kling et al., 2012).

Other economic hypothesized relationships that could be tested for, depend on the primary data collected through the survey, the availability of high quality secondary data, and the context of the study. Such other hypothesized relationships could include geographic proximity for an environmental service having a positive effect on WTP. Perception variables related to providing the commodity tend to also predict the respondent’s WTP. For example, perceptions against the entity carrying out the program, or attitude against the payment vehicle, tend to be negatively associated with WTP.
Step 13 Report study

Step 13.1 Documentation

The CV study should include any supporting documentation of the procedures used to collect the data as well as summary statistics. Such documentation procedures will make data more accessible and assist any reviewers of the study.

I recommend documenting all data collection procedures as the study is being conducted and storing all the documentation in one location.

Refer to Appendix I for an outline of the information that should be documented in a study.

Step 13.2 Presenting the aggregate welfare estimate

The main element in reporting the outcome of a CV study to support decision making is the aggregate welfare estimate (AggWTP). The calculation for aggregate willingness to pay could be demonstrated as follows:

\[ AggWTP = WTP_{\text{Mean or Median}} \times N \]

Where WTP is either the estimated mean or median willingness to pay and N is the size of the affected population.

According to Champ et al. (2017), the following issues need to be addressed before using the equation set above:

1) Whether to use mean or median WTP
2) Whether to weight respondent sample characteristics to ensure it matches the affected population characteristic
3) Whether to take into account the data of respondents who refuse to complete the survey or answer the valuation question
# Appendix

## Appendix A – Recommended Practices for Andket Forest CV Study

<table>
<thead>
<tr>
<th>Step</th>
<th>Step Title (Abbreviated)</th>
<th>Options</th>
<th>Recommended Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Identify Change from Program</td>
<td>Consult an environmental expert in Lebanon and refer to Solino, M., Prada, A. &amp; Vazquez, M. (2009).</td>
<td></td>
</tr>
</tbody>
</table>
| 2    | Affected Population | 1. Andket Population (Use-Values)  
2. Lebanon Population (Use and Non-use Values) | Lebanon Population (Use and Non-use Values) |
| 3    | Data Collection Mode | 1. In-Person Interview  
2. Mail  
3. Phone  
4. Internet  
5. Hybrid | In-Person Interview or Internet based survey if representative online panel available |
| 4    | Sample Size | Refer to Step Section | Consult a survey statistician and consider running a pilot test to determine the sample size needed for a given level of power. |
| 5    | Survey Firm | Refer to Step Section |
| 6.1  | Describe Item | Utilize pretesting procedures to assess the effectiveness of the scenario description provided |
| 6.2  | Provision Mechanism | Biomass Harvesting Program |
| 6.3  | Payment Vehicle | 1. Taxes  
2. Utility Fee  
3. Voluntary Donations  
4. Entrance Fee for Environmental Enclosures  
5. No Payment Vehicle | Avoid tax and voluntary donation vehicles. An Entrance fee payment vehicle is not applicable. Utilize pretesting procedures to assess the effectiveness of the payment vehicle posed to respondents. In cases were multiple payment vehicles are selected, I recommend testing for payment vehicle bias (Refer to payment vehicle section in Step 9.1). |
<table>
<thead>
<tr>
<th>6.4</th>
<th>Decision Rule</th>
<th>1. Aggregated WTP greater than program cost 2. Referendum decision rule</th>
<th>Referendum decision rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.5</td>
<td>Time Frame of Payment</td>
<td>1. One-time Payment 2. Periodic Payments</td>
<td>Periodic payment in line with time horizon of the program. Sensitivity test on aggregated value estimate under different discount rates.</td>
</tr>
<tr>
<td>6.6</td>
<td>Substitute and Budget Reminders</td>
<td>Include substitutes and budget constraint reminders in the CV instrument</td>
<td></td>
</tr>
<tr>
<td>7.2</td>
<td>Values of $0</td>
<td>1. $0-value screen question before value elicitation question 2. Debriefing question for respondents who answer “no” to the elicitation question</td>
<td>Debriefing question for respondents who answer “no” to the elicitation question</td>
</tr>
<tr>
<td>7.3</td>
<td>Address Misleading Responses</td>
<td>Effective CV study design. Refer to interviewer training in Step 11.3 or debriefing questions in Step 9.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CV Study Validity</td>
<td>Effective CV study design. Refer to step 12.3 on ensuring CV accuracy through conducting validity tests.</td>
<td></td>
</tr>
<tr>
<td>9.1</td>
<td>Survey Instrument Design</td>
<td>Refer to Step Section</td>
<td></td>
</tr>
<tr>
<td>9.2</td>
<td>Survey Translation</td>
<td>Refer to Step Section</td>
<td>Pretest the survey instrument</td>
</tr>
<tr>
<td>10</td>
<td>Pretest CV Instrument</td>
<td>1. Focus Groups 2. Cognitive Interviews 3. Small pretest 4. Large pretest (pilot study)</td>
<td>At a minimum the survey materials should be pretested using one of the pretesting procedures mentioned in options.</td>
</tr>
<tr>
<td>11</td>
<td>Survey Implementation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Analyze Data</td>
<td>Refer to step Section</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Report Study</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: The table above offers a brief overview of the recommended approaches or guidance for each step discussed. For steps with no specific options or numerous approaches, the “Refer to Step Section” comment will be inputted in the “Options” column; the third column in the table above.
Appendix B – Back-Of-The-Envelope Sample Size Calculation

Population Proportion Sample Size

In line with the response format recommendation of double-bounded dichotomous choice, refer to Step 7.1, using the following population proportion function to determine sample size would be appropriate.

\[ n = \frac{Z_{\alpha/2}^2 \times p \times 1 - p}{MOE^2} \]

n – sample size

\( Z_{\alpha/2} \) – critical value of the normal distribution (i.e. 95% confidence interval, \( \alpha \) is 0.05 and the critical value is 1.96)

MOE – margin of error

p – sample proportion

The sample proportion is the expectation of the results or variance of the binary variables. This is often determined by using the results of previous surveys or by conducting a small pilot study. If the client is unsure about the expected results, a sample proportion of 50% should be used since it is the maximum variability for a binary variable; hence providing a conservative estimate.

The equation above is appropriate since it estimates the proportion of the population that possesses a particular property communicated through a binary variable of whether to accept the bid amount (1 for yes) or reject the bid amount (0 for no). The equation estimates the sample size needed by taking into account the client’s specified margin of error.

In reference to a double-bounded dichotomous choice, where the survey asks the respondent more than one dichotomous question, the largest sample size across all the elicitation questions should be used.

Using the equation set above with an MOE of 5%, a critical value of 1.96, and a sample proportion of 50% the adequate sample size needed should be approximately 384.

The above equation should be used cautiously since it only takes into consideration elicitation questions with two valid answers, yes or no. If one more additional response is present such as “I don’t know” a different sample size equation should be considered.

The above equation can be used to consider alternative scenarios by varying the four inputs of MOE, confidence level, population size and sample proportion. Please note that the relationship is not linear. Doubling the sample size will not reduce the confidence interval by half.
# Appendix C – Payment Vehicle Comparison

<table>
<thead>
<tr>
<th>Application</th>
<th>Payment-vehicles</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water quality</td>
<td>Water-sewer fees and sales taxes</td>
<td>Water fees report only one-fourth of the WTP of sales taxes</td>
</tr>
<tr>
<td>Conservation of endangered species</td>
<td>Tax mechanism and donations</td>
<td>Donations totaled 35% of the value obtained with the tax</td>
</tr>
<tr>
<td>Ground Water quality protection</td>
<td>New tax and reallocation of existing taxes</td>
<td>WTP 18 times higher with the tax reallocation than with the new tax</td>
</tr>
<tr>
<td>Non-genetically modified food</td>
<td>New tax and reallocation of existing taxes</td>
<td>No statistically differences in mean WTP</td>
</tr>
<tr>
<td>Open space land purchase</td>
<td>Individual contribution, provision point and a tax</td>
<td>Potential differences between payment-vehicles that may occur due to incentive structures</td>
</tr>
<tr>
<td>Damage prevention for wetlands</td>
<td>Levies on income tax, land and water rates, and levies on abattoirs</td>
<td>No difference in mean bids and protest rates between rates and taxes</td>
</tr>
<tr>
<td>Wildlife related amenities</td>
<td>Utility bill and hunting license fee</td>
<td>12% protest-response with utility bill and no protest-response with the fee</td>
</tr>
<tr>
<td>Flood defense work</td>
<td>Donation to an unspecified fund, contribution to a specified fund and a tax</td>
<td>46% protest-response with the first, 23% with the second and 12% with the third</td>
</tr>
</tbody>
</table>

## Appendix D – Summary of Strengths and Weaknesses of Response Formats

<table>
<thead>
<tr>
<th>Elicitation Method</th>
<th>Major Strengths</th>
<th>Major Specific Weaknesses</th>
<th>Generic Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Open-ended WTP method</strong></td>
<td>No starting point bias. May directly measure exactly what researcher wants to know. A good check when used in conjunction with other methods.</td>
<td>High information complexity leads to unrealistic responses in hypothetical situations.</td>
<td>Applicable to most survey methods: sample selection bias; nonresponse bias; outliers; unintended interviewer bias.</td>
</tr>
<tr>
<td><strong>Dichotomous-choice method</strong></td>
<td>“Take it or leave it” choices reduce hypotheticality and approximate the market. Small strategic bias; very small starting point bias.</td>
<td>Less information per respondent, so large samples are needed. Requires analyst to have statistical skills.</td>
<td>Applicable especially to CV methods: hypotheticality bias; payment vehicle; noncommitment bias; order bias; embedding bias; strategic bias.</td>
</tr>
<tr>
<td><strong>Payment card with comparative tax-prices</strong></td>
<td>Encourages realistic assessment of WTP, thus reducing hypotheticality and noncommitment bias.</td>
<td>Moderate to high information complexity. May be too sensitive to particular comparisons. Anchoring bias, often requiring personal interviews.</td>
<td></td>
</tr>
<tr>
<td><strong>Payment card with a range of prices for the good</strong></td>
<td>Moderately low complexity. Low interview bias.</td>
<td>Anchoring bias, often requiring personal interviews.</td>
<td></td>
</tr>
</tbody>
</table>

Source: Pattanayak et al., 2007, p.39; Boardman et al., 2011
### Appendix E – Addressing Potential Biases in CV Studies

<table>
<thead>
<tr>
<th>Bias</th>
<th>Measures for Minimizing Bias</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coverage Error:</strong> Not all members of the affected population have a known nonzero chance of being asked to complete the survey. May result in undercoverage, part of the study population not included in the sample frame, or overcoverage, includes individuals who are not part of the study population.</td>
<td>Ensure the selected sample frame and data collection mode adequately reach the affected population (i.e. Internet data collection mode may exclude the older demographic of the study population for instance)</td>
</tr>
<tr>
<td><strong>Sampling Bias:</strong> Sample may exclude particular subgroup from the population</td>
<td>Strict implementation of sampling strategy, proper replacement strategy, large sample, split sample analysis.</td>
</tr>
<tr>
<td><strong>Nonresponse:</strong> Respondent refuses to answer the question</td>
<td>Preparatory work on phrasing and content should reduce this response. Choosing an appropriate data collection mode. Refusal should be probed with follow-up questions to gauge “protest” intentions. Informed consent is necessary before starting surveys. Well- mannered and neutral enumerators [interviewers] can minimize this risk.</td>
</tr>
<tr>
<td><strong>Measurement Error:</strong> Responses to a survey question do not accurately reflect the underlying desired measure</td>
<td>Proper survey design and question phrasing. Questions should be clearly written using common vocabulary. Utilize pretesting procedures to ensure questions are interpreted correctly.</td>
</tr>
<tr>
<td><strong>Non-Neutrality:</strong> Researchers influence the choice. Respondents attempt to please.</td>
<td>Enumerator [Interviewer] training on neutrality, questionnaire pretesting, focus group discussions, and supervision during survey implementation</td>
</tr>
<tr>
<td><strong>Hypothetical:</strong> Respondents provide hypothetical answer to value a commodity offered in the future.</td>
<td>Formative research (focus groups, key informant) discussion to understand the context and the commodity. Proper CV scenario design, appropriate and credible payment vehicle, debriefing questions, CV scenario with minimum uncertainty of the provision of the commodity. Main objective is to convey that a respondent’s WTP choice could lead to an actual program implementation (portray consequentiality and provide an incentive to respond accurately). Ensure the respondent is reminded of budget constraints and</td>
</tr>
</tbody>
</table>
alternative items to spend on before providing their WTP value. In some cases, giving time to respondents to think about their WTP before responding can help mitigate hypothetical bias and yea-saying answers.

<table>
<thead>
<tr>
<th><strong>Starting Point:</strong></th>
<th>Proper elicitation question, proper bids with adequate range. Closed-ended questions may have very small starting point bias. Iterative bidding method is especially prone to this bias.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents anchor to the initial values given to them.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Strategic behavior:</strong></th>
<th>Proper elicitation question, proper debriefing questions, removal of the questionnaire if there is clear evidence of strategic answers. Closed-ended format reduces the strategic bias. Enumerator training to pay attention to strategic bias during the interviews.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondent purposely eliciting choices with the objective of future free-riding</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Payment Vehicle bias</strong></th>
<th>Engage in pretesting procedures to determine how respondents view the payment vehicle and whether the payment vehicle makes sense within the context of the CV scenario.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondent may misperceive the payment vehicle or object against the payment vehicle which causes them to modify their bid or protest</td>
<td></td>
</tr>
</tbody>
</table>

Source: Pattanayak et al., 2007, p.41; Compiled by the author

For a more comprehensive list of other biases such as the availability bias or status quo bias, refer to Boardman et al. (2011).
The information, questions, order and format contained herein is provided as an illustration of a potential CV survey instrument with the understanding that the author makes no warranties, either expressed or implied, concerning the accuracy, completeness, reliability, or suitability of the survey in the absence of pretesting the CV instrument.
Survey for Valuing a Forest Program

Introduction

We are surveying people about a plan the government along with the Association for Forests, Development and Conservation (AFDC) and the Municipality of Andket are considering to manage the forest in Andket. The AFDC is a non-governmental organization.

The survey findings will be taken into consideration by the government, the Association for Forests, Development and Conservation (AFDC) and the Municipality of Andket when deciding whether or not to pursue the plan in managing the forest in Andket.

This survey is conducted by the United Nations Development Programme.

We expect the survey will take no longer than [x] minutes to complete. Your response is strictly confidential and will not be shared with anyone outside the study team or the Association for Forests, Development and Conservation (AFDC) and the Municipality of Andket. The reports prepared from this study will summarize the total findings and will not identify any responses from specific individuals.

To ensure this, we will store your response separately from your name and address and destroy all name and address files once the analysis of the survey is completed.

Would you like to participate?

<table>
<thead>
<tr>
<th>Household Identification Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household Address</td>
</tr>
<tr>
<td>Respondent Name</td>
</tr>
<tr>
<td>Today’s Date</td>
</tr>
<tr>
<td>Start Time</td>
</tr>
<tr>
<td>Finish Time</td>
</tr>
<tr>
<td>Interviewer Name</td>
</tr>
</tbody>
</table>

ADD A NUMERICAL CODE NEXT TO EACH POSSIBLE QUESTION RESPONSE
BASED ON THE CODEBOOK RULE SELECTED
**Description of the good to be valued**

I will begin by talking to you about an important forest in Lebanon, that you might not have heard of. But first I would like to ask you one question.

**Screening Question:** Do you currently pay a water bill on a monthly basis?

1. Yes
2. No
3. I don’t know

*Interviewer: If the respondent answered “Yes,” PROCEED WITH THE INTERVIEW; If the respondent answered “No” or “I don’t know,” THANK THEM FOR THEIR TIME AND DO NOT PROCEED WITH THE INTERVIEW.*

The forest I will be talking about today is Andket forest. I will show you a series of pictures as I describe it to you.

*Interviewer: Show respondent Card #1*

It is a map of Lebanon. As you could see Andket is located within Akkar.

Many people do not know that Andket contains a forest.

*Interviewer: Point to the forest perimeter image.*

I am pointing now to where the forest lies within the boundaries of Andket.

The forest takes up 20% of the Andket village area. Andket forest is approximately 1,600 hectares, which is about 20% the size of Beirut or equivalent to roughly 2,500 soccer fields.

I am going to tell you more about the forest and then I am going to tell you about a proposed forest management plan. But first I would like to ask you two questions
**Question #1:** Have you ever visited Andket, or do you have any friends or relatives that live in Andket?

1. Yes
2. No
3. I Don’t Know

**Question #2:** Before starting the survey, have you ever heard of Andket forest?

1. Yes
2. No
3. I Don’t Know

Thank you. Here are some pictures of the forest.

**Interviewer:** Show respondent Card #2

The forest is mountainous and contains many tall trees and a diversity of shrubs

**Interviewer:** Show respondent Card #3

The forest has year round water resources. There are many streams that flow through the forest to the main two rivers – “Naher el Mwaqid” and “Naher Oudine” that pass through the forest. Also, the forest has two main water springs – “Nabaa el Charqi” and “Nabaa el Gharbi.” One of the springs is canalized for irrigation purposes.

The forest helps to capture and store rainfall. In the future, Andket forest could help provide clean water to parts of the country that may experience water shortages.

Are you ready to go on?

**Interviewer:** Show respondent Card #4

One main problem in Andket forest is forest fires. Every year the government spends money to fight forest fires. Andket forest has on average [X] forest fires per year affecting [X] ha of the forest area; which is equivalent to [X] soccer fields. The fires have grown more intense and frequent over time.
The fires are often caused by natural phenomenon like the warm dry weather during the summer. Fires particularly originate in areas with combustible vegetation and are made more intense due to high tree density vegetation.

The fires are not often caused by humans.

People and property are rarely affected by any forest fire. However, forest fires have harmful effects on the environment.

I am going to tell you more about the forest fire effects on the environment. But first I would like to ask you one question.

**Question #3: Before starting the survey, have you ever heard of forest fires in Lebanon?**

1. Yes  
2. No  
3. I Don’t Know

Fires increase pollution in the surrounding area. This affects the air quality. Forest fires often lead to the same type of pollution as car exhausts.

Fires increase soil erosion. Some of this soil winds up in rivers, streams and springs, which reduces water quality.

Are you ready to hear about the proposed program?

In order for the government along with the Association for Forests, Development and Conservation (AFDC) and the Municipality of Andket to protect the forest from fires, it must raise money to cover the cost of a forest program.
The forest program involves the trimming and thinning of certain types of trees, shrubs, and non-managed scrubland. The trimming and thinning process aims to get rid of the combustible vegetation that increases the vulnerability of the forest to wildfires. Also, it will reduce the buildup of flammable vegetation increasing the forest’s resistance to fires.

The program will be carried out in a sustainable way. The program is not equivalent to logging. The existence and health of trees will generally remain the same.

The residues, basically the waste, from the trimming and thinning process of the forest program could be converted to a type of fuel used to generate electricity and heat.

This type of fuel is renewable. It is a fuel produced from renewable resources. The forest will constantly have a build-up of combustible vegetation that could be used to produce fuel. This renewable fuel can substitute for fossil fuels. The program will only impact the type of fuel used to generate electricity. It will in no way impact the quality and service of electricity provided to households or businesses in Lebanon.

Institutional Setting

To protect the forest against forest fires through harvesting biomass, the AFDC and Municipality of Andket would be in charge of implementing the forest program and hiring local workers.

Hiring local people would create jobs in Andket village.

---

10 Could consider adding that renewable fuels from the forest residues could contribute to reducing atmospheric pollution, energy dependency, uncertainty of prices and supplies, or depletion of non-renewable resources during electricity generation.
**Payment Vehicle**

In order to pay for the program, it has been decided that the best way is to charge households and businesses more for the water they consume.

*Interviewer: Show Respondent Card #3*

Under this system, you and other households in Lebanon would pay an extra amount each month for the foreseeable future. The extra amount will be routed to a specific fund to cover the program’s cost. A special committee that would include members of the public and non-profit environmental groups would be created to ensure that the money collected is only spent on financing the forest program.

Because the government’s decision could affect your monthly water bill, we want to know if you support this forest program.

To find this out, I am going to show you a table that summarizes the current situation without the forest program and the situation after the program is implemented.

*Interviewer: Show card 9 and read the graphic to the respondent*

**WTP Elicitation**

Now I am going to ask you if you would like the government, along with the Association for Forests, Development and Conservation (AFDC) and the Municipality of Andket, to implement the forest program.

Please take your time responding and carefully consider all the other payments you have to make on a monthly basis and the income your household receives on a monthly basis.

If the majority of people are not willing to implement the program, the program will not be implemented. If the majority of people vote to implement the program, the program will be implemented.

---

11 Could add questions about the scenario to test the respondent’s comprehension. The responses to comprehension questions could be used to further test the validity of the study. More importantly, if the respondent failed to answer the comprehension questions correctly, the interviewer could repeat the scenario description once more to ensure the respondent is informed of the what they are being asked to value. This is incredibly useful, especially before the elicitation question is asked.

12 If pretesting leads to respondents questioning the cost of the program, consider adding the following provision point mechanism regarding the definition of costs the households are likely to bear – “The amount you indicate will tell us what it is really worth to your household to have the program implemented. If the program actually costs less than people
The proposed forest program would increase your monthly household water bill by $X per month. Voting for this program would mean you would have $X less each month to spend on other things.

There may be good reasons for you to vote for implementing the forest program and good reasons for you to vote for not implementing the forest program. Only you know what is best for you and your household.

**Question #4:** Which option would you vote for?

1. Yes, implement the forest program
2. No, do not implement the forest program
3. I don’t know

Thank you for your response.

*Interviewer: If the respondent answered “Yes,” GO TO QUESTION #5; If the respondent answered “No” or “I don’t know,” GO TO QUESTION #6.*

**Question #5:** If the increase to your monthly household water bill is $Higher Bid per month, which option would you vote for now? Please take a moment to consider your response.

1. Yes, implement the forest program
2. No, do not implement the forest program
3. I don’t know

Thank you for your response.

**Question #6:** If the increase to your monthly household water bill is $Lower Bid per month, which option would you vote for now? Please take a moment to consider your response.

1. Yes, implement the forest program
2. No, do not implement the forest program
3. I don’t know

Thank you for your response.

---

For the respondents who answer “I don’t know” to either Question #5 or Question #6 you could treat their response for Question #4 as unbounded when conducting the data analysis.

---

are willing to pay, you would only have to pay what it would cost. If the program turns out to cost more than people are willing to pay, it would not be implemented” (Kwak, S.J., Yoo, S.H. & Han, S.Y., 2003, p. 2212).

---

13 For the respondents who answer “I don’t know” to either Question #5 or Question #6 you could treat their response for Question #4 as unbounded when conducting the data analysis.
Debriefing Questions

Question #7: How sure are you of your decision?

1. Very sure
2. Somewhat sure
3. Equally sure or unsure
4. Somewhat unsure
5. Totally unsure

Question #8: May I ask why you answered [Answer Response of Respondent]?

Answer:

Interviewer: Do not read the options below to the respondent. If the respondent answered no to all elicitation questions, please circle any or all of the responses below that best fits the description of the respondent’s answer to the debriefing question.

1. Cannot Afford
2. Too Costly
3. Authority in charge of implementation would not be effective
4. Frequent payments
5. Program would not be effective
6. Program would not be implemented
7. Payment vehicle not feasible or applicable to them
8. Other

Interviewer: For those who answered at least one “yes” in the WTP Elicitation Section, GO TO QUESTION #9 AND THEN GO TO THE SOCIOECONOMIC PROFILE SECTION; For those who answered “no” to all questions in the WTP Elicitation Section, GO TO QUESTION #10 AND QUESTION #11

However, ensure the interviewer properly records why the respondent answered “I don’t know” for the second elicitation question through the respondent’s response to Question #8 in the Debriefing Section.
**Question #9 (Option 1):** How would you allocate your expenditure across the benefits of the program in percentage terms?

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in Risk of Forest Fire</td>
<td></td>
</tr>
<tr>
<td>Air Quality</td>
<td></td>
</tr>
<tr>
<td>Water Quality</td>
<td></td>
</tr>
<tr>
<td>Rural Development/Local Employment</td>
<td></td>
</tr>
<tr>
<td>Renewable Energy</td>
<td></td>
</tr>
</tbody>
</table>

*Note: Percentage total should sum up to 100%*

**Question #9 (Option 2):** Please identify the level of importance for each reason why you support the implementation of the forest program on a scale of 1 to 4. 1 being “Not Important,” 2 being “Slightly Important,” 3 being “Important,” and finally 4 being “Very Important.”

<table>
<thead>
<tr>
<th>Reasons for Supporting the Program</th>
<th>Not Important</th>
<th>Slightly Important</th>
<th>Important</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in Risk of Forest Fire</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Air Quality</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Water Quality</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Rural Development/Local Employment</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Question #9 (Option 3): Please rank the following four benefits mentioned from 1 to 5. With 1 being the benefit you found to be most important and 5 being the benefit you found to be least important.

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in Risk of Forest Fire</td>
<td></td>
</tr>
<tr>
<td>Air Quality</td>
<td></td>
</tr>
<tr>
<td>Water Quality</td>
<td></td>
</tr>
<tr>
<td>Rural Development/Local Employment</td>
<td></td>
</tr>
<tr>
<td>Renewable Energy</td>
<td></td>
</tr>
</tbody>
</table>

Question #10: Would you pay anything for the change proposed?

1 Yes
2 No (This is to be considered as a value of $0)

Interviewer: For those who answered “no” to all questions in the WTP Elicitation Section and also gave a reason along the lines of “Payment vehicle not feasible or applicable to them,” GO TO QUESTION #11; otherwise, GO TO THE SOCIOECONOMIC PROFILE SECTION

Question #11: How do you think the money for the forest program should most likely be collected?

Answer:

Socioeconomic Profile

We would like to ask you a few questions about you and your household. I would like to remind you that the reports prepared from this study will summarize the total findings and will not identify any responses from specific individuals. Your answers will not be saved nor stored in a way that could be associated with your name and address.

Responses to these questions will be used only for statistical purposes and to compare the total characteristics of all survey respondents to the Lebanese population as a whole.
Question #12: May I please know your age?

_____ Years

Question #13: May I please know your current marital status?

1 Single, never married
2 Married or living with a long term partner
3 Separated or divorced
4 Widowed

Question #14: How many children under the age of 18 are living in your home?

_____ Children

Question #15: How many adults above the age of 18 are living in your home, please include yourself?

_____ Adults

Question #16: What is your current job?

Answer:

Interviewer: Do not read the options below to the respondent. Please circle one option below that best fits the description of the respondent’s answer to Question #15.

1 Management 6 Factory worker
2 Large business owner 7 Farmer/Agricultural worker
3 Small business owner 8 Other
4 Specialist/Professional 9 Don’t work (student, housewife, etc.)
5 Clerical/Retail Sales 10 Unemployed
Question #17: What is your highest level of education?

Answer:

Interviewer: Do not read the options below to the respondent. Please circle one option below that best fits the description of the respondent’s answer to Question #15.

1   No formal education  5   Bachelor degree
2   Completed primary education 6   Master or other graduate degree
3   Completed junior high school 7   Other
4   Completed high school

Question #18: What is your household’s monthly water expenditure?

_____ Dollars

_____ Lebanese Pounds

Question #19: What is your household’s total monthly income including everyone?

1   No Income  6   $4,001 - $5,000
2   $1 - $1,000  7   $6,001 - $7,000
3   $1,001 - $2,000  8   $7,001 - $8,000
4   $2,001 - $3,000  9   Above $8,000
5   $3,001 - $4,000  10  Refused to Answer

Question #20: We are interested in how people are getting along financially in Lebanon. Would you say you and your family were better off, worse off or the same financially than you were a year ago?

1   Better off
2   Worse off
3   The same

Question #21: What is your religion?

1   Christian (Maronite, Greek Orthodox, or Greek Catholic)
2   Muslim (Shia or Sunni)
3   Druze
4   Other
**Question #22:** Did you visit any forests in Lebanon in the past 12 months?

1. Yes
2. No

**Question #23:** Do you consider yourself as a person who is concerned with or advocated the protection of the environment?

1. Yes, strongly
2. Yes, somewhat
3. Not sure
4. No, somewhat
5. No, strongly

**Question #24:** Did you visit any rural villages or areas in Lebanon in the past 12 months?

1. Yes
2. No

**Question #25:** Do you consider yourself as a person who is concerned with or advocated for rural development?

1. Yes, strongly
2. Yes, somewhat
3. Not sure
4. No, somewhat
5. No, strongly

**Question #26:** Please consider the following statements:

**Statement #1:** The government spends money efficiently in ways that benefit the public

1. Strongly agree
2. Somewhat agree
3. Not sure
4. Somewhat disagree
5. Strongly disagree

**Statement #2:** The government has many responsibilities that require the expenditure of money. With respect to environmental protection, do you think the government is currently spending too much, too little or just about the right amount of money?

1. Too much
2. The right amount
3. Too little
**Question #27:** Do you think the government of Lebanon should place a higher priority on economic development or protecting the environment?

1. Economic Development
2. Protecting the Environment

*Interviewer: The remaining questions should be filled out by you, DO NOT ASK THE SURVEY RESPONDENT*

**Question #28:** What was the gender of the respondent?

1. Male
2. Female

**Question #29:** What language was the survey instrument written in?

1. Arabic
2. French
3. English

**Question #30:** What language was the interview given in? (Check all that apply)

1. Arabic
2. English
3. French

**Question #31:** Rate the attentiveness of the respondent

1. Not attentive at all
2. Somewhat attentive
3. Very attentive
Survey Cards

Card #1

Source: UNDP CEDRO, 2016, p. 78
Card #2

Source: UNDP CEDRO, 2016, p. 98

Source: UNDP CEDRO, 2016, p. 80
Card #3

MAKE SURE TO CROP OUT ALJAZEERA LOGO IF THESE PHOTOS ARE TO BE USED TO ENSURE IT DOES NOT LEAD TO A BIASED RESPONSE

Source: UNDP CEDRO, 2016, p. 82
Card #5

Card #6

Source: DeShazo et al. (2015)
Card #7

Source: UNDP CEDRO, 2016, p. 36
Card #8

| Card #9 |
|-------------------|-------------------|-------------------|
| **No Program**    | **Forest Program**|
| Forest Fire Frequency and Intensity | [x]-[y] times a year; [x]-[y] ha a year | [z]-[t] times a year; [z]-[t] ha a year |
| Air pollution from fire smoke | Range of emissions should be in line with the respective ranges set above with respect to forest fires. Must hedge who it affects (only people around the forest for instance) and put the description of change in an annual context. |
| Water quality in streams, rivers, and springs in areas burned | [Other Relevant Metric on an annual basis] | [Other Relevant Metric on an annual basis] |
| Jobs created in Andket | 0 | Approximately [x] on an annual basis for a period of [x] months employed |
| Replacement of Non-Renewable Energy Sources | No replacement of non-renewable sources OR Show current percentage mix of Lebanon’s energy sources for electricity | Could replace [x] barrels of a non-renewable energy source like oil on an annual basis OR Show current percentage mix of fuel sources of Lebanon with biomass taking a bigger chunk |

The above card is just a template, refer to two other samples below used in actual stated preference surveys for more guidance.
## Sample #1

<table>
<thead>
<tr>
<th></th>
<th>Option 1: Current management</th>
<th>Option 2: Burn beetle-killed trees on-site</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pine beetle-killed trees (acres infested)</strong></td>
<td>![Diagram of trees]</td>
<td>![Diagram of trees]</td>
</tr>
<tr>
<td><strong>% Forest burned every 10 yr</strong></td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Forest fire frequency</strong></td>
<td>![Diagram of fires] More frequent, intense wildfires</td>
<td>![Diagram of fires] Less frequent, less intense wildfires</td>
</tr>
<tr>
<td><strong>Air pollution from fire smoke (# average days)</strong></td>
<td>High air pollution 10 unhealthy days</td>
<td>Low air pollution 4 unhealthy days</td>
</tr>
<tr>
<td><strong>Greenhouse gas emissions</strong></td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td><strong>Water quality in streams and lakes in areas burned</strong></td>
<td>Frequently muddy</td>
<td>Rarely muddy</td>
</tr>
<tr>
<td><strong># of months recreation areas are closed</strong></td>
<td>6 months</td>
<td>2 months</td>
</tr>
<tr>
<td><strong>Annual cost to taxpayers</strong></td>
<td>$0</td>
<td>5–$700 (the bid varies from 5 to $700)</td>
</tr>
</tbody>
</table>

**Sample #2**

<table>
<thead>
<tr>
<th></th>
<th>Policy A</th>
<th>Policy B</th>
<th>No protection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Logging</strong></td>
<td>150,000 ha</td>
<td>0 ha</td>
<td>300,000 ha</td>
</tr>
<tr>
<td></td>
<td>![Image of animals] Half these species go extinct</td>
<td>![Image of animals] None of these species go extinct</td>
<td>![Image of animals] All these species go extinct</td>
</tr>
<tr>
<td><strong>Poaching</strong></td>
<td>0 ha</td>
<td>150,000 ha</td>
<td>300,000 ha</td>
</tr>
<tr>
<td></td>
<td>![Image of animals] None of these species go extinct</td>
<td>![Image of animals] Half these species go extinct</td>
<td>![Image of animals] All these species go extinct</td>
</tr>
<tr>
<td><strong>Floods in Perak</strong></td>
<td>3 per year</td>
<td>1 per year</td>
<td>5 per year</td>
</tr>
<tr>
<td><strong>Jobs created in Perak</strong></td>
<td>5,000</td>
<td>7,500</td>
<td>7,500</td>
</tr>
<tr>
<td><strong>Cost to you</strong></td>
<td>RM8 per month</td>
<td>RM8 per month</td>
<td>No cost</td>
</tr>
</tbody>
</table>

Source: DeShazo et al., 2015, p.96
Appendix G – Sample Effects of Biomass Harvesting Program

A. Environmental externalities:
+ Decreases the emission of CO₂ and other gases that pollute the atmosphere.⁹
+ Avoids or decreases problems of environmental deterioration (erosion, desertification, oil spills, etc.).
+ Contributes to cleaning the woodlands, to natural regeneration and the growth and quality of forests (woodland).
+ Decreases risk of fires and facilitates extinguishing.¹⁰
+ Improves conservation of the forests since it facilitates silviculture plans for woodlands and brush (by eliminating competing vegetation).
+ Improves the phytosanitary status of the woodlands and reduces the risk of pests and environmental illnesses.
+ Avoids problems from uncontrolled dumping of waste and sub-products. There is almost no waste derived from electricity production and, in addition, the ash obtained in the combustion process serves as fertiliser.
  – Problems may arise from “non-environmentally friendly” extraction: loss of nutrients, erosion, alkalisation of irrigated land, changes in the landscape and ecosystems, and loss of biodiversity.
  – It may be negative effects from the use of heavy machinery in woodland: soil compaction, changes in the landscape, noise pollution, pollutant emissions, etc.
  – Local pollution.

B. Non-environmental externalities:
B.1. Economy:
+ Helps to guarantee supply while respecting the environment.
+ Helps to diversify energy sources.
+ Increases security in prices.
+ The autochthonous character lowers the degree of energy dependence and improves the balance of payments.¹¹
+ Lowers costs in transport of electricity due to the decentralised location of the power plants.

B.2. Society:
+ Employment: this is a new source of income since it is based on an asset that has previously not been marketed.¹²
+ Favourable impact on industry as a whole.
+ Sustainable development: non-depletion of non-renewable sources.
+ Rural development and improvement of inter-regional equity: generates a positive impact on the industrial sector and on job opportunities in rural communities, helps mitigate the depopulation of the countryside and improves geographical equity.

*Note: This list may be non-exhaustive or not accurate for the conditions in Lebanon. As recommended refer to an environmental expert in Lebanon.

Source: Solino, M., Prada, A. & Vazquez, M., 2009, p.410
# Appendix H – Rules of Good Interview Practice: Do’s and Don’ts for Interviewers

<table>
<thead>
<tr>
<th>Rule</th>
<th>Advice</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Read every question exactly as written in the questionnaire – Do not improvise.</td>
<td>Research on the art of asking questions shows that the precise wording of questions may significantly affect a respondent’s answers. If each enumerator develops her own way of asking questions, one can never be sure that the same question is being asked. Ensure that each respondent is answering the same question. Reading the question exactly also makes the interview shorter.</td>
</tr>
<tr>
<td>2</td>
<td>Read the question slowly enough so that the respondent can understand.</td>
<td>An enumerator has seen each question hundreds of times before. It is natural for the enumerator to want to go quickly over a question that he knows so well, but it is the first time for the respondent. The enumerator thus needs to speak slowly.</td>
</tr>
<tr>
<td>3</td>
<td>Wait for the respondent to answer.</td>
<td>Some enumerators will read the question once, then look up and repeat the question, and sometimes even start a lengthy explanation, before letting the respondent answer. Ask once very clearly, and let the respondent think.</td>
</tr>
<tr>
<td>4</td>
<td>If the respondent cannot answer, repeat the question.</td>
<td>The respondent may not have been paying attention the first time. If, after the second reading the respondent still cannot answer, go to the next question.</td>
</tr>
<tr>
<td>5</td>
<td>Remain absolutely neutral about the respondent’s answers.</td>
<td>Never express surprise, approval, disapproval, judgment, or doubt about a response. Do not let your facial expression change. Just record the answer. For example, if a respondent says that they would be willing to pay a very large amount for a good or service, the enumerator should not say, “wow!” If a respondent gives an answer that is factually wrong, the enumerator should not reveal that he knows the answer is incorrect.</td>
</tr>
<tr>
<td>6</td>
<td>Do not act embarrassed about a respondent’s answers to sensitive questions.</td>
<td>This will increase the embarrassment of the respondent, not reduce it. Be very matter of fact.</td>
</tr>
<tr>
<td>7</td>
<td>Never suggest an answer unless the instructions say to read the answers to the respondent.</td>
<td>For example, if the respondent is having difficulty estimating what he will pay for a good or service, do not prompt him with suggestions like... “would you pay more than US$xx? Less than zz?”</td>
</tr>
<tr>
<td></td>
<td>Do not repeat the respondent’s answers.</td>
<td>This is repetitive and wastes time.</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9</td>
<td>Conduct the interview in private. If someone does not want to leave, the enumerator should offer to interview him or her separately. If they still would not leave, then the enumerator should explain to the respondent that he will have to return later.</td>
<td>This means that the interview should not be within earshot of other people in the household.</td>
</tr>
<tr>
<td>10</td>
<td>Do not give advice to respondents on personal matters.</td>
<td>Enumerators should refer respondents to the appropriate authorities for answers to questions that may arise that are outside the scope of the interview.</td>
</tr>
<tr>
<td>11</td>
<td>Answer directly any questions the respondent may have about the purpose of the survey.</td>
<td>Respondents are entitled to know the purpose of the survey and how they have been selected to be interviewed. The enumerator should not be reluctant to take time to provide clear, detailed answers to such questions.</td>
</tr>
<tr>
<td>12</td>
<td>Listen carefully to the respondent’s answer.</td>
<td>It is very off-putting to the respondent if the enumerator is inattentive. Moreover, the respondent may be offering an answer that is in fact different than it first appears to be. In such cases the enumerator needs to be listening carefully to hear what is actually being said.</td>
</tr>
</tbody>
</table>

# Appendix I – Study Documentation Guidelines

<table>
<thead>
<tr>
<th>Step</th>
<th>Item to document</th>
<th>Information to include</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Study plan</td>
<td>Date</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Initial budget</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Study proposal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Theoretical definition of the estimated value that includes the current condition or baseline and the change values</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The steps in the design process</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Focus groups/one-on-one interviews</td>
<td>Dates</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Location</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Costs (amount paid to participants, food, facility rental, etc.)</td>
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<td></td>
<td></td>
<td>Focus group moderator/interviewer</td>
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<td>Number of participants (do not include names or addresses of participants)</td>
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<td>Handouts</td>
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<td>Agenda</td>
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<td>Video and/or audio recordings</td>
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<td></td>
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<td>Interview or focus group summaries</td>
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<td>List of design items changed or discarded in response to the results of pretesting</td>
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<tr>
<td><strong>Step 3</strong></td>
<td>Sample</td>
<td>Description of study population</td>
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<tr>
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<td>Description of sample frame</td>
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<td>Procedures for selecting sample units</td>
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</tbody>
</table>
| Step 4 | Final Survey | Cost of sample  
Number of sample units  
Data included with sample  
Text of letter or script used to invite potential respondents  
Questionnaires with commodity description and valuation scenario  
Dates of all survey contacts  
Number of respondents to each wave of contact |
|---|---|---|
| Step 5 | Data | Codebook  
Final sample size  
Frequencies (including missing values) for each measure in the survey  
Means/medians for continuous measures  
Data file in format useable for data analysis software |
| Step 6 | Data Analysis | Methods of econometric analysis, including treatment of $0 values and protest responses  
Methods used to calculate sample and descriptive statistics  
Respondents demographic characteristics, and use or preferences for the item valued |
Estimates of central tendency and dispersion
Robustness checks

Source: Champ et al., 2017, p.79; Compiled by the author
References


