Forest Resource Management: An Empirical Study in Northern Pakistan

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Abstract: Community participation for forest sustainability and use of forest resources for community development is considered a vital way in all societies. This study was conducted to assess the public views toward sustainable forest management in the area of Gilgit–Baltistan, Pakistan, through collecting data from 255 respondents. Views about forest management techniques at different levels were discussed. Three main areas of focus to manage forest resources were: strategic-level management, local-level management, and communication-level management. To provide confidence and to measure factors affecting sustainable forest management, this study applied the structural equation modeling approach and built a model that explained and identified the critical factors affecting sustainable forest management. A quantitative approach via Smart Partial Least Squares version 3.2.8 was used for analysis. The findings of the study show that the $R^2$ value of the model was 0.653, which means that the three exogenous latent constructs collectively explained 65.3% of the variance in sustainable forest management. In this study, the goodness of fit of the model was 0.431, which is considered valid for further analysis. Among the three proposed levels for forest management, the strategic-level-management factor was found the most important of the three variables. This study concluded that for better and sustainable forest management, policies should flow from the strategic level to the local and also focus on communication-level management because all these factors appear to be significant in measuring sustainable forest management. Community engagement and awareness are also found to be an important way for forest resource management.

Keywords: forest management; community engagement; public awareness; government role; integrated rural development

1. Introduction

Forest management is one of the key issues of countries. Nations depend on forest and forest resources to fulfill different needs of daily life. The sustainable management of forestry is a worldwide concern because of the importance of forest resources for the environment and for a clean society [1]. Community involvement in proper forest management has been deemed crucial [2,3]. Governments develop different policies to manage their countries’ forests for a sustainable ecosystem [4]. Public involvement is considered an important part of improved forest management [5]. Local residents may see forestry as an important source of income and yet may use it without proper management: as a result, deforestation can quickly become unsustainable [6]. Improper management of forest resources is a key issue in developing countries, posing a significant threat of damage to land and other natural resources [7]. The impact of improper forest management is not only limited to directly affected countries but at length spreads to the whole world [8,9]. To identify the issues related to forest resource management [10,11] in Gilgit–Baltistan,
Pakistan, a survey was conducted and the views of various residents of mountainous regions were collected and analyzed. The outcomes of this research are not only beneficial for the local public, but they are also instructive for forest management study in this general socio-economic and natural setting. In light of the results and recommendations of this study, local as well as central governments can formulate policies regarding proper forest management for better natural resource utilization. There was also a gap between policy following from central government to local administration; this study also significantly justified different roles of management at different levels. For future research, the outcomes of this study can also be used to expand the concept and to elaborate the outcomes of this study in other areas as well.

2. Literature Review

In the literature, forest management is considered a branch of forestry due to administrative issues, economic concerns, and social impacts of forestry within and without scientific experiments, as well as regarding regulations of forest policies [12,13]. Forest management is a broader concept where different researchers include the management of aesthetics, fishery, recreational resources, urban values and outputs, water management, wildlife resources, wood products, forest genetic resources, etc. [14,15]. Some other researchers believe that forest management may consider conservation and economic forest management or a combination of conservation and economic output [16,17]. Researchers indicated that forest management is a technical field that includes timber extraction, the planting of forestry and replanting of various species within a specific context, looking after the cutting roads and pathways within forests, and so on [18–20]. Some researchers argued that forest management includes all the techniques necessary for sustainable forest management and for forest recycling [21,22].

2.1. Public Sharing in Sustainable Forest Management

The role of the public and the local community is considered a key backbone for better forest management [17,23]. Most research work on community forestry management suggests that local-community people usually play a key role in better forest management [24,25]. Researchers believe that locals, who are essentially the main beneficiaries of the forest, usually are the main cause of damage to natural resources such as forests [12,26,27]. Prior research shows two levels of forest management for public control: local-level management and central-government policy [28]. Local-level management consists of local-community-based policies where people take part in policy formulation for the betterment of the forest and environmental protection [29,30].

2.2. Government Sharing in Sustainable Forest Management

In previous studies, it was indicated that central and local governments are also fully responsible for better forest management by making policies and implementation of regulations [30,31]. Public government sharing and communication of the forest policies to the public are also considered the key roles of governments for the betterment of forest management [32,33]. Previous studies showed that proper forest management for the long-run livelihood is considered the main goal of the environmental departments of governments [34]. Governments use different channels to give more information to the public about forest management [35]. In any case, whether through a public–private partnership or pure government policies for forest management, it is important to link forest management for sustainable and long-run management. Researchers describe different views about sustainable forest management in different settings. Here, some recent and very famous studies are analyzed.

2.3. Sustainable Forest Management

In the literature, sustainable forest management examines the main principles of sustainable development [12,36]. Sustainable management is directly related to sustain-
able development [37,38]. In other research, it is also mentioned that sustainable forest management is the name for keeping balance between three areas: ecology, economy, and socio-cultural settings [39,40]. Sustainable forest management has a direct impact on the livelihood of people by providing clean air, protecting the ecosystem, reducing rural poverty, and mitigating the effects of climate change [18,41].

In the charter of the United Nations, proper forest management was considered the main obligation of governments at all levels: local, regional, and global [42]. In view of the United Nations policies regarding forest management, different countries are trying to protect the livelihood of the forest with some solid steps such as formulating policies for cutting timber and using the forest for commercial purposes such as renewable energy projects, etc. [43,44].

A universally accepted definition of sustainable forest management [45] was provided as:

“The stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems.”

2.4. Current Forest-Management Situation in Gilgit–Baltistan, Pakistan

Current forest management in world especially in Gilgit–Baltistan, Pakistan, is not satisfactory [46,47]. When looking at the forest management policies at the government and community levels, it is found that there is no policy toolkit that can be taken as guidelines for proper forest management [48]. Neither has remarkable research been done nor have steps been taken to identify the current issues and problems for local forest management [48]. Records show that nearly 5.36% of Pakistan’s total landmass is covered by forests of its total land with 15.7 (GNP), 0.2% (GDP) share on average per annum, according to 2010 calculations [48], while some other reports such as FAO (Food and Agriculture Organization) statistics for 2009 show that the forest cover in Pakistan is hardly touching figures of 6%, with 2% of natural forest and 4% covered by plantations and human-made gardens [48]. The area of Gilgit–Baltistan, Pakistan, encompasses an area of 7,040,000 hectares, with a forest-covered area of 950,000 hectares (13.4%) of its total area and province-wise Pakistan forest-cover share of estimated 9% [48]. Proper management of forestry also appears necessary from global-scale data, where research showed that 12–15 million hectares of forest are lost each year. Some studies have forecasted that the deforestation rate in Pakistan is 0.2 percent to 0.5 percent annually, which is the highest worldwide [48]. In view of the issues existing in Gilgit–Baltistan in forest management, this study aimed to present a guideline policy toolkit that will not only help government institutions, but it will also be a principal policy toolkit for the community to look after the forest resources. The current issues of forest management in GB, Pakistan, are very technical, and local community ownership is crucial to managing the forest.

3. The Hypothesis of the Study

The study hypotheses are as follows:

**Hypothesis 1 (H1).** Strategic-level-management factor has a significant and positive effect on sustainable forest management.

Here, strategic-level forest management means the policies follow from central government to provincial government. There are some policies that are set for the central government’s role to protect the forest of the whole country. This hypothesis intended to build a relationship between central government policy and its implementation strategy toward proper forest management. At the end of this analysis, the sub-factors that are set to measure central/strategic-level forest management are taken as policy points for proper forest management.
Hypothesis 2 (H2). Local-level-management factor has a significant and positive effect on sustainable forest management.

Local-level policies that are set by the provincial government for forest management are tested in this hypothesis. There are some policies that are set by the local government for proper forest management. Policies that have an impact on proper forest management are sorted out, and their impact on forest resource management at the local level is identified. The end results of this hypothesis will ensure the factors for proper forest management at the local level.

Hypothesis 3 (H3). Communication-level-management factor has a significant and positive effect on sustainable forest management.

Communication plays an important role in informing the community regarding any issue. This hypothesis is set to identify the information and communication facilities available for the community to become well aware of forest management. The importance of communication for forest management is tested here, and some policy points are drawn at the end.

In this conceptual model in Figure 1, a relationship is drawn between the independent variables—strategic-level management, local-level forest management, and communication-level forest management—and the dependent variable sustainable forest management. The main purpose of this conceptual model is to map the relationships between these variables and to point out some policy issues to facilitate the governments and community for forest management. Based on the relationships between these variables, hypotheses were developed and tested.

Figure 1. Conceptual model.

4. Materials and Methods

This study was undertaken in the area of Gilgit–Baltistan, Pakistan. A quantitative survey was conducted to identify the views and practices of the locals about sustainable
forest management of the region. The quantitative investigations were based on the pre-tested data collection instrument and used after taking necessary tests. In this research, some concepts that had been previously tested in other investigations with different perspectives were tested in this specific study area. The study focused on the quantitative method of investigation which helped the researchers to investigate the characteristics of the study population quantitatively. The study investigations did not focus on the qualitative approach because of the nature of the study. In data collection, data testing, and data analysis sections, the focus is also given to analyzing and explaining the data quantitatively. There were a total of 255 respondents from different regions of Gilgit Baltistan, Pakistan. Figure 2 shows the districts of Gilgit–Baltistan where the study was conducted.

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The area of Gilgit–Baltistan is entirely natural, and forests are situated everywhere [49,50]. Although the forests in Gilgit–Baltistan exist in a natural environment, human interference disturbed the forest resources, and it is also an alarming situation for future forest reservation. To understand the current situation of forests better, the study sample encompassed the eight districts of Gilgit–Baltistan, Pakistan: Gilgit, Skardu, Astore, Kharmang, Ghizer, Ghanchi, Hunza, and Nager. A probability cluster-sampling method was used to collect the data. The whole province was divided into districts/clusters, and the data were collected accordingly.

4.1. Preliminary List of Factors

To identify the main factors affecting sustainable forest management, researchers conducted a comprehensive and critical literature review and found three types of factors that are supposed to be the main factors affecting sustainable forest management [28–30]. The three levels of forest management include: strategic-level forest management, local-level forest management, and communication-level forest management [49]. The questionnaire was divided into two sections; section one consisted of the demographics of the study, and section two comprised the main variables for sustainable forest management. For better analysis and understanding, section two was categorized into four sub-groups in accordance with the nature of the factors: the codes for variables were
strategic-level-management factor (STM_L), local-level-management factor (LOCL_M), communication-level-management factor (COM_L), and sustainable-forest-management factor (FOR_M). Table 1 shows the constructs for the main dependent and independent variables of the study.

Table 1. The preliminary list of factors affecting sustainable forest management.

| Code  | Factors                                                  |
|-------|----------------------------------------------------------|
| STM_L1 | Central legislation                                      |
| STM_L2 | Check and control                                        |
| STM_L3 | Professional forestry planning                           |
| STM_L4 | Protected forestry areas                                 |
| STM_L5 | Input opportunities and policy implementation             |
| STM_L6 | Protect aesthetic values                                 |
| STM_L7 | Security for forestry companies                          |
| STM_L8 | Attention on timber resources                            |
| LOCL_L1 | Responsive to public concerns                           |
| LOCL_L2 | The direct benefit for the local community               |
| LOCL_L3 | Instant economic benefit from forest                     |
| LOCL_L4 | A fair share of locally generated government income      |
| LOCL_L5 | Environment-sensitive initiatives for locals             |
| LOCL_L6 | Useful infrastructure for local forestry                 |
| COM_L1 | Get information about the forest through media          |
| COM_L2 | Aware of current situations of the forest through local government bodies |
| COM_L3 | Trusted information among forest managers and local people |
| COM_L4 | Can post any problem with forest situation               |
| COM_L5 | A good information way available toward misuse of forest resources |
| COM_L6 | Take necessary actions on the news posted in mass media about any forest management issue |
| COM_L7 | A good communication channel available between central and local government for forest management |
| FOR_M1 | A sustainable way of getting information about forest management available |
| FOR_M2 | A strong role of local community participation           |
| FOR_M3 | Seen long-term planning for sustainable forest management |
| FOR_M4 | Overall, seen better and sustainable forest-management problem-solving techniques |

4.2. Pilot Study and Questionnaire Design

To test the feasibility of the study and to test the relationship of the pre-study variables, a pilot study was conducted. The questionnaires were administered by the researchers to obtain instructions on the factors affecting sustainable forest management from the experts. Based on the significant pilot test results, the final questionnaire was designed, and the study was conducted accordingly.

After conducting a pilot survey, certain minor adjustments were made to the questionnaire. The final questionnaire was split into two key sections for better questionnaire management. Section one contained the respondents’ demographic profile such as educational qualification, income range, and material status, etc. Section two of the questionnaire consisted of the final list of the questions on a five-point Likert scale ranging from 1 to
5. The questionnaires were presented to the respondents in the field, and data were collected accordingly.

4.3. Respondents’ Demographics

Table 2 shows the demographic information of the respondents. The respondents were selected from a wide range of local community living in Gilgit–Baltistan. Table 2 shows different demographic segmentations.

Table 2. Demographic information of respondents on average.

| Age   | Percentage |
|-------|------------|
| Less 10 | 0.9        |
| 10–18  | 39.6       |
| 19–30  | 39.6       |
| 31–45  | 14.2       |
| Above 45 | 5.7       |
| Total  | 100.0      |

| Education level | Percentage |
|-----------------|------------|
| Under 10th Grade| 22.6       |
| 10th Grade      | 10.4       |
| 12th Grade      | 17.9       |
| Bachelor’s      | 22.6       |
| Master’s        | 25.5       |
| Ph.D.           | 0.9        |
| Total           | 100.0      |

| Income level   | Percentage |
|----------------|------------|
| Less than 8000 | 39.6       |
| 8001–15000     | 18.9       |
| 15001–30000    | 12.3       |
| 30001–45000    | 18.9       |
| 45001 and above| 10.4       |
| Total          | 100.0      |

| Gender | Percentage |
|--------|------------|
| Male   | 46.2       |
| Female | 53.8       |
| Total  | 100.0      |

| Material status | Percentage |
|-----------------|------------|
| Married         | 30.2       |
| Unmarried       | 68.9       |
| Divorced        | 0.9        |
| Total           | 100.0      |

The purpose of obtaining the demographic information from respondents was to find out more about the respondents’ personal characteristics. In data analysis, this demographic information is used to identify more in-depth facts in the field. Researchers also used demographics in different studies. In this study, some basic demographic information of the respondents was analyzed and conclusions were drawn. This information also helped the researchers to identify the awareness level, educational literacy, personal characteristics, and income level of the respondents that have a direct relationship with the response toward any issue. In this study, the respondents’ demographics had a direct relationship with the response toward sustainable forest management.

4.4. Sampling and Data Collection

The data were collected through team members consisting of the researchers and forest experts. The sample unit was selected from different districts of Gilgit–Baltistan,
Pakistan. The sample was based on the list of respondents living in Gilgit–Baltistan and actively involved in the factors related to social issues. The data were considered enough for analysis as the main variables were chosen from literature and the results area also related to the main theme of the research. There was a total of 300 respondents who were supposed to be the sample for this study; among them, 255 responses were collected. The respondents had enough experience to understand the importance of the study conducted in the field. The data collected from respondents were considered enough statistically because the total population of Gilgit–Baltistan is very small and such a number is enough to generalize the results.

5. Results

Simulation work in calculating the effect of the observed variables and their latent constructs on sustainable forest management was drawn in Smart Partial Least Squares version 3.2.8 [51]. Majority of researchers use Partial Least Squares-Structural Equation Modeling for theory development in exploratory research [52]. Major applications of SEM contain path analysis, second-order factor analysis, confirmatory factor analysis, regression models, correlation structure models, and covariance structure models [53]. The PLS-SEM method has some advantages over other methods. The structural equation modeling technique permits the examination of the linear connections between the latent constructs and manifest variables. SEM has the ability to create accessible parameter estimates for the relationships between unobserved variables in the model. A collective data analysis facility is also available in a single model with various relationships instead of examining each relationship separately. This is the reason researchers prefer to use this method over other methods. The hypothesized model in Figure 1 for sustainable forest management was analyzed using SmartPLS version 3.2.8 which has advantages over regression-based methods in evaluating several latent constructs with various manifest variables for sustainable forest management [54]. SmartPLS consists of a two-step procedure as recommended by Henseler et al. [54], which contains the evaluation of the outer measurement model and evaluation of the inner structural model. Furthermore, PLS-SEM is currently known and selected within social sciences studies as a technique that is the most appropriate method for multivariate analysis, such as in the current study [55,56].

Appendix A shows a comprehensive explanation of the descriptive statistics of the study such as mean, standard deviation, kurtosis, and skewness, etc. The results of kurtosis and skewness (values lie between $-1$ and $+1$) show that the data were normally distributed to measure sustainable forest management. Furthermore, the results of this study are discussed in a rational way for easy understanding of the issues related to sustainable forest management.

5.1. Evaluation of Outer Measurement Model

The outer measurement model is designed to calculate the reliability, validity, and internal consistency of the observed variables, calculated through the survey method, together with unobserved variables [57]. Consistency evaluations are based on construct reliability tests and single observed variable while convergent and discriminant validity is used for the measurement of validity [58]. In this model, single-observed-variable reliability concludes the variance of an individual observed comparatively to an unobserved variable by evaluating the standardized outer loadings of the observed variables [59]. Researchers noted that observed variables with an outer loading of 0.7 or greater are greatly acceptable for predictions and model evaluations [58], whereas an outer loading with a value of less than 0.7 is to be discarded and not acceptable [60]. Nevertheless, for the current study, the cut-off value accepted for the outer loading was considered as 0.7. Table 3 shows that the outer loadings ranged between 0.759 and 0.909. For internal consistency testing, composite reliability (CR) and Cronbach’s alpha were used in the construct reliability. Some researchers believe that composite reliability (CR) is a better way for measurement of internal consistency as compared to Cronbach’s alpha because it maintains the stan-
standardized loadings of the observed variables in the model [61]. The results in this study show the values of Cronbach’s alpha communication level (COM_L = 0.896), local level (LOCL_M = 0.910), strategic level (STM = 0.951), forest management (FOR = 0.861), and composite reliability (COM = 0.918, LOCL = 0.931, STM_L = 0.959, FOR_M = 0.906) which indicate that the composite reliability and Cronbach’s alpha values are greater than the minimum requirement of 0.70. For the measurement and verification of the convergent validity of the variables, the latent construct’s average variance extracted was measured [61]. Previous studies show that the lowest 50% of the variance from the observed variable should be measured by the latent constructs in the study model and the AVE for all constructs should be more than 0.5. In this study, the results in Table 3 show that all of the AVE values (COM = 0.615, LOCL = 0.691, STM = 0.744, FOR = 0.706) are more than 0.5 and valid for convergent validity measurement. The results also support the argument that there are good values for convergent validity and good internal consistency for the measurement model of this study.

Table 3. Construct reliability and validity.

| Main Constructs                  | Items   | Loadings | Cronbach's Alpha | CR | AVE  |
|----------------------------------|---------|----------|------------------|----|------|
| Communication-Level Management   | COM_L1  | 0.770    | 0.896            | 0.918 | 0.615 |
|                                  | COM_L2  | 0.784    |                  |     |      |
|                                  | COM_L3  | 0.853    |                  |     |      |
|                                  | COM_L4  | 0.785    |                  |     |      |
|                                  | COM_L5  | 0.759    |                  |     |      |
|                                  | COM_L6  | 0.774    |                  |     |      |
|                                  | COM_L7  | 0.762    |                  |     |      |
| Local-Level Management           | LOCL_M1 | 0.812    | 0.910            | 0.931 | 0.691 |
|                                  | LOCL_M2 | 0.810    |                  |     |      |
|                                  | LOCL_M3 | 0.815    |                  |     |      |
|                                  | LOCL_M4 | 0.860    |                  |     |      |
|                                  | LOCL_M5 | 0.880    |                  |     |      |
|                                  | LOCL_M6 | 0.808    |                  |     |      |
| Strategic-Level Management       | STM_L1  | 0.837    | 0.951            | 0.959 | 0.744 |
|                                  | STM_L2  | 0.879    |                  |     |      |
|                                  | STM_L3  | 0.889    |                  |     |      |
|                                  | STM_L4  | 0.909    |                  |     |      |
|                                  | STM_L5  | 0.868    |                  |     |      |
|                                  | STM_L6  | 0.855    |                  |     |      |
|                                  | STM_L7  | 0.808    |                  |     |      |
|                                  | STM_L8  | 0.882    |                  |     |      |
| Sustainable Forest Management    | FOR_M1  | 0.825    | 0.861            | 0.906 | 0.706 |
|                                  | FOR_M2  | 0.815    |                  |     |      |
|                                  | FOR_M3  | 0.876    |                  |     |      |
|                                  | FOR_M4  | 0.844    |                  |     |      |

Further measurements were related to the discriminant validity of the latent variables. Discriminant validity shows whether the manifest variable in any model is unique from other variables in the path model and its cross-loading value in the latent variable is more than that in any other variable [62]. Some researchers used tests such as the Fornell and Larcker criterion and cross-loadings to measure discriminant validity [61]. Researchers suggested a standard for variables that a construct must not contain the same variance as any other construct that is more than its AVE value [62]. Table 4 describes the Fornell and Larcker standard test of the study model where the squared correlations were compared with the correlations from other latent variables. Table 4 shows satisfactory discriminant validity in that all of the correlations were smaller relative to the squared root of average variance exerted along the diagonals. These results also indicate that the observed variables in every construct show the given latent variable confirming the discriminant validity of
the study model, while Table 5 shows that the cross-loading of all observed variables was more than the inter-correlations of the variables of all the other observed variables in the study model.

Table 4. Fornell–Larcker criterion test.

|                     | COM  | FOR  | LOCL | STM  |
|---------------------|------|------|------|------|
| Communication-Level Management (COM) | 0.784 |      |      |      |
| Sustainable Forest Management (FOR) | 0.554 | 0.840 |      |      |
| Local-Level Management (LOCL) | 0.243 | 0.559 | 0.832 |      |
| Strategic-Level Management (STM) | 0.204 | 0.582 | 0.256 | 0.863 |

Table 5. Cross-loadings.

|          | COM  | FOR  | LOCL | STM  |
|----------|------|------|------|------|
| COM_L1  | 0.770 | 0.395 | 0.170 | 0.178 |
| COM_L2  | 0.784 | 0.439 | 0.194 | 0.162 |
| COM_L3  | 0.853 | 0.498 | 0.195 | 0.232 |
| COM_L4  | 0.785 | 0.443 | 0.211 | 0.103 |
| COM_L5  | 0.759 | 0.406 | 0.224 | 0.148 |
| COM_L6  | 0.774 | 0.412 | 0.202 | 0.140 |
| COM_L7  | 0.762 | 0.436 | 0.141 | 0.147 |
| FOR_M1  | 0.472 | 0.825 | 0.459 | 0.457 |
| FOR_M2  | 0.470 | 0.815 | 0.446 | 0.493 |
| FOR_M3  | 0.474 | 0.876 | 0.484 | 0.501 |
| FOR_M4  | 0.445 | 0.844 | 0.489 | 0.503 |
| LOCL_M1 | 0.257 | 0.475 | 0.812 | 0.210 |
| LOCL_M2 | 0.163 | 0.471 | 0.810 | 0.224 |
| LOCL_M3 | 0.229 | 0.478 | 0.815 | 0.193 |
| LOCL_M4 | 0.165 | 0.432 | 0.860 | 0.226 |
| LOCL_M5 | 0.172 | 0.457 | 0.880 | 0.226 |
| LOCL_M6 | 0.219 | 0.470 | 0.808 | 0.196 |
| STM_L1  | 0.196 | 0.517 | 0.215 | 0.879 |
| STM_L2  | 0.140 | 0.467 | 0.194 | 0.850 |
| STM_L3  | 0.210 | 0.546 | 0.245 | 0.909 |
| STM_L4  | 0.191 | 0.570 | 0.232 | 0.868 |
| STM_L5  | 0.137 | 0.483 | 0.196 | 0.855 |
| STM_L6  | 0.149 | 0.445 | 0.236 | 0.808 |
| STM_L7  | 0.201 | 0.511 | 0.243 | 0.882 |
| STM_L8  | 0.170 | 0.456 | 0.199 | 0.847 |

Based on the study results, it is confirmed that the cross-loading measurement standards show an acceptable validation for the discriminant validity of the measurement model. Overall, the study results support an acceptable model with confirmation of adequate reliability, convergent validity, and discriminant validity and the verification of the research model for further implementations.

5.2. Evaluation of the Inner Structural Model

Previous results confirm that the measurement model was valid and reliable for further analysis. After validation of the data and model, the next aim of the analysis was to measure the inner structural model outcomes for this study. The purpose of this measurement is to observe the model’s predictive relevancy and the relationships among the variables. The coefficient of determination ($R^2$), path coefficient ($\beta$ value) and T-statistic value, the predictive relevance of the model ($Q^2$), effect size ($f^2$), and goodness of fit (GOF) are the key standards for evaluating the inner structural model.
5.2.1. Value of $R^2$

For the overall effect size, the coefficient of determination is used, variance is explained in the endogenous construct for the structural model, and it uses a model's predictive accuracy for the study.

In the current analysis, the inner path model was 0.653, as shown in Figure 3, for the endogenous latent variable such as sustainable forest management. These results show that the three independent variables such as strategic-level-management factor, local-level-management factor, and communication-level-management factor substantially explain 65.3% of the variance in the quality measurement, and it was further concluded that about 65.3% of the change in sustainable forest management was due to three latent variables in the model. Some researchers suggested that a value of $R^2$ of 0.75 is substantial, the $R^2$ value of 0.50 is considered moderate, and the $R^2$ value of 0.26 is nominated as a weak value for model prediction. In this study, the $R^2$ value (0.653) is more than the required value and hence is considered moderate.

![Figure 3. Assessment of the structural equation model.](image)

5.2.2. Assessment of Path Coefficients ($\beta$) and T-Statistics

The results indicate that the path coefficients in the SmartPLS and the standardized $\beta$ coefficient in the regression analysis seem the same. The purpose of measurement of the $\beta$ is to know the expected variation in the dependent variable for a unit variation in the independent variable. In this analysis, the $\beta$ values of every path in the hypothesized model were measured. Studies show that the higher the $\beta$ value, the better the substantial effect on the endogenous latent variable. Moreover, the T-statistics test is considered compulsory for the verification of the $\beta$ value significance. The bootstrapping procedure was used to evaluate the significance of the hypothesis. To test the significance of the path coefficient and T-statistics values, a bootstrapping procedure using 5000 subsamples with no significant changes was carried out for this study as presented in Table 6.
Table 6. Path coefficient and T-statistics.

| Hypothesized Path                      | Standardized Beta | T-Statistics | p Values |
|----------------------------------------|-------------------|--------------|----------|
| Communication > Forest Management      | 0.382             | 10.870       | 0.000    |
| Local > Forest Management             | 0.361             | 9.668        | 0.000    |
| Strategic > Forest Management         | 0.412             | 10.737       | 0.000    |

For H1, the prediction was about the strategic-level-management factor, and it was supposed that the strategic-level-management factor significantly and positively influences sustainable forest management. The values in Table 6 and Figure 3 confirmed that the strategic-level-management factor significantly influenced sustainable forest management ($\beta = 0.412, T = 10.737, p < 0.000$). Hence, H1 was strongly supported for this study. Testing the influence of local-level management on sustainable forest management (H2), the findings from Table 6 and Figure 3 show that the local-level-management factor positively influenced sustainable forest management ($\beta = 0.361, T = 9.668, p < 0.000$). The influence of the communication-level factor on sustainable forest management was also positive and significant ($\beta = 0.382, T = 10.870, p < 0.000$), providing supportive evidence for H3. Moreover, Figure 4 shows the graphical representation of the path coefficient.

Figure 4. Graphical representation of the path coefficient.

5.2.3. Measuring the Effect Size ($f^2$)

To test the effect of a single independent variable on the dependent variable, $f^2$ was used; it is the degree of the impact of each exogenous latent construct on the endogenous latent variables. To find the effect size of variables, there is a need to remove latent exogenous variables and run the tests to identify the changes in the value of the coefficient of determination ($R^2$) and define whether the removed latent exogenous construct has a significant influence on the value of the latent endogenous variable or not. If the value of $f^2$ was 0.35, it was considered to be a strong effect, 0.15 moderate effect, and 0.02 weak effect [63]. Table 7 shows the $f^2$ from the structural equation model calculations. As shown in Table 7, the effect size of strategic-level management, local-level management, and communication-level management was 0.447, 0.337, and 0.387, respectively. Therefore, according to Cohen’s findings, the $f^2$ of the communication-level and strategic-level exogenous latent variables on sustainable forest management had a strong effect, whereas local-level management had a medium effect on the value of $R^2$. Furthermore, all three independent latent variables in this study participated to a relatively greater $R^2$ value (65.3%) in the dependent variable (sustainable forest variable).
Table 7. Effect size.

| Exogenous Latent Variables            | Effect Size $f^2$ | Total Effect  |
|--------------------------------------|-------------------|---------------|
| Communication-Level Management       | 0.387             | Strong effect |
| Local-Level Management               | 0.337             | Medium effect |
| Strategic-Level Management           | 0.447             | Strong effect |

5.2.4. Predictive Relevance of the Model ($Q^2$)

$Q^2$ statistics were used to measure the quality of the PLS path model, which is calculated using blindfolding procedures [64], and cross-validated redundancy was performed. The $Q^2$ criterion suggests that the conceptual model can predict the endogenous latent constructs. In SEM, the $Q^2$ values measured must be greater than zero for a particular endogenous latent construct. Figure 5 shows that the $Q^2$ value for this study model was equal to 0.431, which was higher than the threshold limit, and supports the fact that the path model’s predictive relevance was adequate for the endogenous construct.

![Figure 5. Predictive relevance of the model.](image)

5.2.5. Goodness-of-Fit Index

The goodness of fit (GOF) is used to test the complete model fit to determine whether the model sufficiently explains the empirical data in the study or not [17,64]. The goodness-of-fit-index values that are between 0 and 1 are supposed to be supportive, and the measurement values of 0.10 (small), 0.25 (medium), and 0.36 (large) indicate global acceptance of the path model for the study. Researchers indicate that a good model fit suggests that a model is stingy and credible [65]. To measure the goodness of fit, the geometric mean value of the average communality (AVE values) and the average $R^2$ value(s) are used. Equation (1) is used to measure the goodness of fit.

$$GOF = \sqrt{\text{Average AVE} \times \text{Average } R^2}$$  

With the values in Table 8, the goodness of fit was measured and was 0.670. The results
show that the empirical data of this study are fit for the satisfactory model measurement and have substantial predictive power in comparison with standard values.

Table 8. Goodness-of-fit index calculation.

| Construct                        | AVE  | \( R^2 \) |
|----------------------------------|------|-----------|
| Communication-Level Management   | 0.615|           |
| Local-Level Management           | 0.691|           |
| Strategic-Level Management       | 0.744|           |
| Sustainable Forest Management    | 0.706|           |
| Average Values                   | 0.689| 0.653     |
| \( AVE \times R^2 \)             | 0.4499|           |
| \[ \text{GOF} = \sqrt{AVE \times R^2} \] | 0.670|           |

5.2.6. The Standardized Root Mean Square Residual (SRMR)

The standardized root mean square residual is an index of the average of standardized residuals between the observed and the hypothesized covariance matrices in a study model. The standardized root mean square residual is measured for the estimated model fit of the study. Previous studies suggested that when \( \text{SRMR} \leq 0.08 \), the study model has a good fit and is acceptable [20], and with a lower standardized root mean square residual, it is considered a better fit. The results in Table 9 show that this study model’s standardized root mean square residual is 0.053, which shows that this study model had a good fit and was applicable for further conclusions; on the other hand, the Chi-square was equal to 1486.720, and the NFI equal to 0.740 was also measured, which also supports the study.

Table 9. Model-fit summary.

| Estimated Model |
|-----------------|
| SRMR            | 0.053 |
| \( d_{ULS} \)   | 0.900 |
| \( d_G \)       | 1.282 |
| Chi-Square      | 1486.720 |
| NFI             | 0.740 |

Furthermore, the HTMT ratio of correlations was also computed, which was proposed by Henseler et al. [18] as a new instrument for evaluating the discriminant validity of constructs involved in measurement models. As a rule of thumb, an HTMT value of more than 0.85 shows a potential issue of discriminant validity. All the HTMT values in the current study in Table 10 were less than the benchmark of 0.85, which signifies that there is no problem of discriminant validity.

Table 10. HTMT.

| Exogenous Latent Variables         | (COM) | (FOR) | (LOCL) |
|------------------------------------|-------|-------|--------|
| Communication-Level Management (COM)| 0.629 |       |        |
| Sustainable Forest Management (FOR)| 0.268 | 0.630 |        |
| Local-Level Management (LOCL)      | 0.218 | 0.640 | 0.274  |

5.3. Correlation Coefficient of Latent Variables

The results in Table 11 helped the researchers to identify the latent variable correlation coefficient which shows that there was a strong correlation between the latent independent variables and the latent dependent variables.
Following with the complete analysis of the measurement models and structural model for this study, it was concluded that both models were confirmed and supposed to be supportive of this study. The three hypotheses for this study were statistically significant and were all accepted. The results of this study show an exact picture of the factors affecting sustainable forest management.

The statistical tests presented in this study were just to test the significant relationship among different variables. Beyond these tests and mathematical numbers in this research, a general message is also evident which reveals that the flow of community participation and government policy from top to bottom is very important to manage natural resources such as forest resources [66,67]. The community showed a positive response toward the importance of government policy flow from top to bottom and appreciated the communication among all three levels of proposed forest management.

### 6. Discussion and Recommendations

The main contribution of this investigation was the empirical revelation of the constructs that affect sustainable forest management by using the PLS-SEM technique. The data analysis helped the authors to elicit some relevant discussion about the current situation of the forest and issues related to sustainable management. The evaluation technique used here, i.e., PLS-SEM is a very effective technique for development and analysis of complex frameworks and also fruitful for future predictions. In this study, conceptual paths were tested using SEM based on SmartPLS methods. For better understanding, descriptive analyses such as the mean value, standard deviation, skewness, and kurtosis values were measured and coded. Testing the normality of the data, the results of the kurtosis and skewness values of the measurement model were measured as between +1 and −1. These values show that the data are normally distributed and acceptable for further data analysis (Appendix A). Moreover, the results of this study prove that strategic-level management, communication-level management, and local-level management had a significantly positive effect on sustainable forest management ($R^2 = 0.653, p = 0.000$), predictive relevance ($Q^2 = 0.431$), and substantial GOF (GOF = 0.670). The final SEM results reveal that strategic-level management had the highest path coefficient ($b = 0.447$), overall influencing sustainable forest management.

Many questions were asked about three levels of forest management, i.e., strategic-level forest management, local-level forest management, and communication level for forestry management. The results of the study reveal that all hypotheses were supported and sustainable forest management was highly affected by all three exogenous constructs, i.e., strategic-level management, local-level management, and communication-level management. The results in Table 7 show that the path between all three latent independent variables with a dependent latent construct (sustainable forest management) has a positive relationship and was statistically significant. Therefore all three hypotheses proposed in this study were accepted. The results in Figure 3 show that the most important factors in strategic-level management for sustainable forest policy are considered professional forestry planning (0.909 F-loading) and security for forestry companies (0.882 F-loading). The main sub-constructs for sustainable forest management in local-level management were highlighted as environment-sensitive initiatives for locals (0.880 F-loading) and a fair share of locally generated government income (0.860 F-loading). The main variables for sustainable forest management via communication-level management were highlighted as:

| Table 11. Latent variable correlation. |
|----------------------------------------|
| **(COM)** (FOR) (LOCL) (STM)          |
| Communication-Level Management (COM)   | 1          |
| Sustainable Forest Management (FOR)    | 0.554      |
| Local-Level Management (LOCL)          | 0.243 0.559|
| Strategic-Level Management (STM)       | 0.204 0.5820.256 1 |

Many questions were asked about three levels of forest management, i.e., strategic-level forest management, local-level forest management, and communication level for forestry management. The results of the study reveal that all hypotheses were supported and sustainable forest management was highly affected by all three exogenous constructs, i.e., strategic-level management, local-level management, and communication-level management. The results in Table 7 show that the path between all three latent independent variables with a dependent latent construct (sustainable forest management) has a positive relationship and was statistically significant. Therefore all three hypotheses proposed in this study were accepted. The results in Figure 3 show that the most important factors in strategic-level management for sustainable forest policy are considered professional forestry planning (0.909 F-loading) and security for forestry companies (0.882 F-loading). The main sub-constructs for sustainable forest management in local-level management were highlighted as environment-sensitive initiatives for locals (0.880 F-loading) and a fair share of locally generated government income (0.860 F-loading). The main variables for sustainable forest management via communication-level management were highlighted as:
trusted information among forest managers and local people (0.853 F-loading) and “post any problem about forest situation” (0.785 F-loading).

Figure 3 also shows responses relating to overall sustainable forest management. The responses show attitudes toward different strategies and techniques of the central government and strategic-level forest management. The overall responses show factors necessary for strategic-level forest management. Among the highlighted factors for this study, the locals of Gilgit–Baltistan think that strategic-level forest management has a more significant impact compared to other variables (Beta Coefficient = 0.412). It further explained that for sustainable forest management, strategic-level planning is more beneficent and useful for better sustainable forest management. In view of the results in Figure 3, it is highly recommended to the central government that the central policy formation and implementation should be supplied for other bodies related to sustainable forest management.

7. Conclusions
This study tried to identify issues related to sustainable forest management in rural areas where many problems exist such as policy communication and implementation issues, etc. The investigation found three levels of proper forest management: strategic level, local level, and communication level. All three levels of forest management were drawn from previous studies, and data were collected accordingly to identify the issues related to forest and forest resource management. This study concluded that for sustainable forest management, the valid factors are strategic-level management, local-level management, and communication-level management. Among these three constructs, the main factor that has a high impact is considered to be strategic-level issues. The results of this study were drawn from structural-equation-modeling techniques using Smart Partial Least Squares software version 3.2.8. The inferential statistical results show that sustainable forest management is possible if all three levels are covered and maintained properly. In view of the results of this research, central and local governments can formulate better policies to boost proper forest management for a sustainable life by focusing on the strategic, local, and communication channels to supply valid and important information to the local community. The three objectives of the study were clearly answered and concluded that all three levels of forest management are very important for maintaining and obtaining strategic goals. Community engagement toward forest management has also become an important way to manage forest resources. Plans and strategies should flow from the central government to local authorities and also engage the community for policy formation regarding forest issues. Community participation and awareness programs for local residents is also considered to be the main technique to manage forest resources. This study found some key variables/factors that are very relevant to forest management at all three levels. All these sub-factors were tested and considered valid to manage the forest. In this study, the target was only to know local residents’ views about sustainable forest management in a specific area. It was very limited with a small sample size and a specific geographic location. Future research may include more variables and more data related to forest- and land-related issues and conduct the study worldwide.

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Appendix A

| Items      | Mean | Standard Deviation | Excess Kurtosis | Skewness |
|------------|------|--------------------|-----------------|----------|
| COM_L1     | 3.369| 0.977              | −0.717          | 0.043    |
| COM_L2     | 3.376| 0.986              | −0.604          | −0.072   |
| COM_L3     | 3.196| 0.950              | −0.376          | −0.043   |
| COM_L4     | 3.525| 1.001              | −0.166          | −0.377   |
| COM_L5     | 3.663| 0.988              | −0.345          | −0.410   |
| COM_L6     | 3.467| 0.995              | −0.564          | −0.237   |
| COM_L7     | 3.647| 0.998              | −0.998          | −0.207   |
| LOCL_M1    | 3.651| 0.978              | −0.479          | −0.290   |
| LOCL_M2    | 3.275| 1.011              | −0.501          | −0.160   |
| LOCL_M3    | 3.043| 0.979              | −0.278          | −0.188   |
| LOCL_M4    | 3.110| 0.972              | −0.574          | 0.010    |
| LOCL_M5    | 3.153| 0.964              | −0.519          | 0.073    |
| LOCL_M6    | 2.776| 1.026              | −0.434          | 0.065    |
| STM_L1     | 3.761| 1.007              | −0.471          | −0.457   |
| STM_L2     | 3.682| 0.919              | −0.614          | −0.243   |
| STM_L3     | 3.800| 0.988              | −0.340          | −0.498   |
| STM_L4     | 3.235| 1.017              | −0.375          | −0.171   |
| STM_L5     | 3.784| 0.972              | −0.448          | −0.431   |
| STM_L6     | 3.525| 1.001              | −0.365          | −0.306   |
| STM_L7     | 2.722| 0.965              | −0.464          | 0.108    |
| STM_L8     | 2.733| 0.962              | −0.469          | 0.104    |
| FOR_M1     | 3.600| 0.981              | −0.530          | −0.232   |
| FOR_M2     | 2.902| 1.003              | −0.322          | −0.013   |
| FOR_M3     | 3.804| 0.946              | −0.129          | −0.493   |
| FOR_M4     | 3.592| 0.997              | −0.722          | −0.185   |

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