



WILDLIFE CONSERVATION SOCIETY

EASTERN FORESTS PROGRAM

TIMBER TRADE SURVEY

FINAL REPORT

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Timber market in Kabul; product dominated by poplar round logs destined for new construction in the city. March 2007. Photo: WCS, Deen Mohammad.

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Wood bazaar, Sang-i-Naweshta, located at the south entrance of Kabul. Surveyors estimated as many as 70 trucks arrived at this bazaar daily, loaded with firewood from the eastern provinces. March 2007. Photo: WCS, Sharbat Khan.

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EXECUTIVE SUMMARY

The central story in many reports on Afghanistan is the quarter century of instability and war that has resulted in the destruction of vital infrastructure; a fractured government challenged to provide direction outside Kabul; health standards, literacy rates, and poverty that rank among the world's worst; and a bankrupt economy almost completely reliant on foreign aid.

The agricultural sector, including forestry, has suffered significant losses during this period of conflict not only from the breakdown in societal controls, but also by prolonged drought. At least one official website for the country states that forested lands before the war covered roughly 4.5 percent of the country (approx. 3 million hectares). War and shortages of alternative fuel sources have combined to increase the fuelwood harvests and cause rapid deforestation throughout the natural forests in the country. UNEP reports that Afghanistan has lost an estimated 60% to 80% of its orchards and vineyards; with only marginal gains reported in recent years. Losses to forest cover have been similarly staggering; greater than 50-60% in most of the country (UNEP 2003). The most recent information claims that Afghanistan has an estimated 1.9 million hectares of forest cover remaining. The exact total of forest cover remains in question and given the results of this report and the implications in particular for cedar, oak and juniper forests, total forest cover may be in fact less than the reported amount.

There is no indication that the trend of overuse in Afghanistan's natural forests has changed. As the timber trade information contained in this report indicates, timber harvests are continuing at a rate that likely exceeds the capacity of the forests to be sustained or recover from past abuses.

Over a four month period (Nov. 2006 – Feb. 2007), WCS conducted an extensive survey of the timber trade market in Kabul and gathered additional anecdotal information specific to timber trade in the eastern forest region. The survey team documented 198 wood markets

Timber trade in the Kabul market alone is greater than 2% of Afghanistan's gross domestic product. This estimate does not include the value of cedar trade, direct cross-border trade with Pakistan, or timber trade in other parts of the

located within the city limits of Kabul, of which WCS surveyed 58% (114 markets). Within these markets, surveyors counted a total of 1,719 woodlots, with an average number of 15 woodlots per market. In all cases, the woodlots surveyed operate as stand-alone operations. We estimate an overall timber trade volume in Kabul of more than 62 thousand m³ per month during the winter months of November through March, with only slightly lower volumes estimated for the rest of the year. This translates

into more than 400 trucks loaded with an average of 5m³ of wood arriving in the city on a daily basis. Based on reported monthly sales and average values, we estimate total monthly sales of \$15 million. We estimate annual volumes and values as high as 745 thousand m³, worth as much as \$175 million on the domestic market.

At this level, timber trade in the Kabul market generates an economy greater than 2% of the country's reported gross domestic product; (est. as \$8.4 billion; Source: US Department of State); a figure that does not reflect the value of cedar trade, direct cross border trade with Pakistan from at least three timber rich provinces (Nangarhar, Kunar and Nuristan), or timber trade in other parts of the country. The addition of these sales volumes and values would

add significantly to our estimate, likely making timber trade one of the leading factors in the country's economy. This is a surprising finding considering the general impression that Afghanistan has little forest cover left (2%) and therefore apparently little margin for such a robust timber related economy.

With a population of more than 4.3 million people, Kabul is one of the primary timber markets in the country, drawing upon forest resources from at least 16 provinces (including the eastern forests) and three other countries (Russia, Pakistan and Uzbekistan). The top five regional sources for timber product in Kabul are, in order of importance, Pakiya (48% of annual sales volumes), Khost (29%), Ghazni (8%), Bamyan (4%), and Wardak (3%). Additional sources, inside and outside the country, in order of trade volume include Russia (3%), Pakistan (2%), Paktika (2%), Logar (1%), Parwan (0.3%), Kunar (0.2%), Kabul (0.1%), Balkh, Uruzgan, Daikondy (<0.1%), Kunduz, Uzbekistan, Baghlan, and Sari Pul (<0.1% respectively) (Table 32; see Appendix p. 67).

Surprisingly, timber originating from Kunar and Nuristan, two of the most timber rich provinces in Afghanistan and the eastern forest region, is only marginally represented in the Kabul market surveys. Kunar only had 0.2% and Nuristan did not occur at all.

Contrary to expectations, the most important forested provinces (Nuristan and Kunar) do not account for an appreciable percentage of timber trade in Kabul. Only two eastern provinces, Pakiya and Khost, figure prominently in our estimates for Kabul timber trade volumes; at 48% and 29% respectively. Other provinces from the eastern forest region, Paktika (2%) and Logar (1%), showed relatively small market shares. Timber originating from Kunar and Nuristan, two of the most timber rich provinces in Afghanistan and the eastern forest region, is only marginally represented in the Kabul market surveys. Kunar only had 0.2% and Nuristan did not occur at all.

In some instances, respondents reported selling timber that originated in Pakistan and Russia. WCS staff has been so far unable to confirm these trade routes; however, reasons exist to suspect that both of these may in fact represent additional harvests from Afghanistan. Some respondents to the survey claimed that this timber originates in forested regions in northeastern Afghanistan, crosses the border into Pakistan, and is then declared as an import upon reentry. As explained by timber traders, wood harvested in these areas can be more efficiently transported to Kabul along eastern trade routes through Pakistan, and then repatriated somewhere along the border closer to the final destination. The recent logging ban adds an additional incentive to this venture, as the "import" status makes the wood a 'legal' product. Similar to the cedar trade, this particular trade chain and the associated volume is not within the capacity of the survey team and therefore cannot be accurately estimated.

Indirect evidence (virtual absence of stock in Kabul) and anecdotal information (descriptions of ongoing trade) suggest that cedar trade is almost entirely captured by direct trade with Pakistan. However, without additional information, there is no way to reasonably estimate annual trade volume for cedar and assess its probable impact on the remaining cedar stands. Interviews by WCS staff with US military personnel operating in Kunar describe a highly visible and continuing timber trade moving east across the Pakistan border. WCS also observed trucks loaded with cedar from Kunar in transit through Kabul. When questioned, transporters reported that they were headed for timber markets in Dubai. However, this information couldn't be independently verified. In the Kabul markets, surveyors found

252.3m³ in stock in a total of 11 woodlots from the 1,719 surveyed, with a reported annual turnover rate of 998m³ or 1,720 m³ when scaled up to the entire Kabul market. Either estimate represents only 0.2% of the total timber trade in Kabul, a tiny fraction of the suspected trade volume.

The vast majority of the annual timber trade volume in Kabul is firewood (79%; or 585 thousand m³); comprised mostly of oak and juniper species. This volume of harvest may be affecting as many as 25,000 hectares of forested

The vast majority of the annual trade volume for all timber trade in Kabul is firewood (79% of all timber trade, firewood = 585 thousand m³); comprised mostly of oak (*Quercus dilatata* and *Q. baloot*, 57% of all firewood trade) and juniper species (*Juniperus excelsa*, 43% of all firewood trade). The reported source for both of these species is the eastern forest region

(Paktiya and Khost). The true impact of this harvest level is difficult to measure as there have been no studies that provide data on the average cubic meters of standing timber per hectare for the oak and juniper species growing in Afghanistan. However, to give some idea of the potential impact this trade is having we have taken average figures for similar species occurring in other areas. For example, assuming 32.5m³ per hectare for oak,¹ and that harvests are taking live trees, then the current harvest rate may be culling more than 10 thousand hectares of oak forest each year. Considering the limited distribution of oak forest in the eastern forest region, this translates into severe pressure on the resource. Using a figure of 24m³ per hectare for juniper,² rough estimates for this harvest would be approximately 15 thousand hectares of forest, per annum; for a combined impact of firewood harvests (oak and juniper) of around 25,000 hectares per year.

Of particular concern is the fact that we feel our estimates are low for the Kabul market and of course do not reflect markets in other areas drawing upon the same resource. In addition, both juniper and oak are slow growing trees that are difficult to regenerate. Without exact figures, it is impossible to say with any degree of

While firewood represents the highest volumes (79%), construction wood has the highest economic value (76% of annual sales) with lombardy (*Populus nigra*) and Himalayan (*P. ciliata*) poplar being the most common (17% of estimated annual trade

certainly how long Afghanistan's oak and juniper resources will last. Many feel that absent extraordinary efforts they will be depleted in the near term.

While firewood represents the highest harvest volumes (79%), construction wood has the highest economic value (76% of annual sales) with lombardy (*Populus nigra*) and himalayan

¹ Based on a range of 25–40m³ per hectare.

² Average volumes per hectare for juniper are highly variable (in similar areas in Tajikistan they can range from 10m³ to 120m³; http://www.cac-biodiversity.org/tjk/tjk_forestry.htm) depending on a number of factors including rainfall, elevation, soil, growing season, etc. In the eastern forests, average rainfall does not exceed 400mm per annum. Using only this as a measure, a very rough estimate for standing timber volume in this area might be about 24m³/ha.

(*P. ciliata*) poplar being the most common (17% of estimated annual trade volumes). The primary source for both species is Afghanistan's agro-forest system. Wherever practicable, fast growing tree species (typically poplar varieties) are grown along irrigation canals and harvested as a primary construction material. This type of trade is not cause for concern in terms of natural forest loss as it is a cultivated renewable resource. It may be that there are other reasons for concern related to agricultural practices, but these questions are outside the scope of this survey.

Given the security constraints in the eastern forests, it is unlikely in the near term that anyone will be able to accurately measure the sources and volume of trade coming from Nuristan and Kunar, or the region as a whole. Most development organizations are restricted in their ability to travel in the region and work with local communities directly. Work is therefore being conducted from a distance with necessarily limited continuity and results. Furthermore, the connection between timber trade and other forms of illicit trafficking makes even simple inquiries by locals a risky venture. Unless there is significant change in the willingness and ability of national and local governments to bring the trade under control, effective interventions will be far fewer than might otherwise be expected. The Ministry of Agriculture and Irrigation is responsible for forest related activities, but is presently not in a position to control timber harvests and trade domestically, let alone across the border with Pakistan.

For now, the ban on logging is causing no noticeable change in harvest preferences or volumes. This survey, other interviews, and reports all indicate that timber trade continues at an unchanged rate. Indeed, the only discernible impact of the logging ban, reported by several respondents, is an increase in prices of approximately 30% immediately following the announcement of the ban. This might be seen as a positive sign considering that at least some reaction is visible from just the threat of enforcement, even if it has yet to materialize on the ground.



Typical scene in a village in northern Afghanistan with irrigated fields surrounded by poplars and other agro-tree species. April 2007. Photo: WCS, J. Wingard.

CLIMATE AND AFGHANISTAN'S FORESTS

WCS has not conducted an independent assessment of forest resources for the whole of Afghanistan. However, to assist the reader in understanding the results of the timber trade survey, background information from several sources has been included. Those already familiar with the country's forest resources are encouraged to read the methods and results sections beginning on pp. 12 and 19, respectively.

Generally, Afghanistan's climate is representative of an arid, semi-steppe environment, marked by cold winters, particularly in the northern provinces, and long, hot, mostly dry summers. Precipitation generally fluctuates greatly during the course of the year in all parts of the country and is one of the primary limiting factors in determining forest types and distribution. Climate regions and associated forest types are described in the following paragraphs.

NOTE ON GIS AND MAPPING OF FORESTS

Before discussing the status of forests in Afghanistan, we should note that the maps reproduced in this report are not yet the product of WCS's final assessment. They are drawn from existing data produced by other organizations prior to WCS's involvement. The maps therefore constitute a baseline for the analysis WCS is currently conducting that will be reported on separately at a later date.

These maps imply a reasonable understanding of the past and present status of Afghanistan's forest resources. But like all information reduced to map form, appearances can be misleading. Our knowledge of the historic and present extent of forest resources in Afghanistan is still limited. For obvious reasons, groundtruthing of past and present data has either not been conducted or done on an extremely limited basis; with the result that some of what is depicted as forest cover may not in fact be accurate. In addition, the differences in mapping methods (e.g., seasons, image interpretation, groundtruthing methods, etc.) used in different studies will likely make it impossible to accurately compare the results of present studies against historical information.

For purposes of this draft, we have used the most widely accepted assessment showing a current forest coverage of about 1.9 million hectares (2% of Afghanistan's territory) (UNEP 2003). The Eastern Forests Program is currently acquiring and analyzing remote sensing data that we will couple with field surveys in selected areas. This report will be updated to include a discussion of these results when available.

EASTERN MOUNTAINS

In the mountains bordering Pakistan in Afghanistan's eastern provinces of Nuristan, Kunar, Nangarhar, Paktiya, Paktika, Khost and Logar (see Figure 3) – a divergent fringe effect of the monsoon, generally coming from the southeast, brings tropical air masses that determine the climate between July and September. During this season, moisture laden air masses advance into central and southern Afghanistan bringing increased humidity and welcome rain.

Although the forests in the eastern part of the country receive substantially more rain than the rest of the country, they are not "rainforests" as defined by foresters. Rainforests are characterized by high rainfall, with definitions setting minimum normal annual rainfall between 1,750mm and 2,000mm. The highest precipitation rates in the eastern region are only 400mm. The eastern monsoon area encompasses patches in the eastern border area with Pakistan, in irregular areas in eastern Afghanistan from north of Asmar to just north of Darkh-e Yahya, and occasionally as far west as the Kabul Valley.

The forests of this region are typically **mixed conifer forests** at higher elevations (>1800m asl) and **oaks** at lower elevations (<1800m asl) (FAO, 2006). This is the largest and most densely forested area in the entire country and has been the focus of WCS's Eastern Forests assessment work (Figure 2, p. 7). This is also only area in the region where mixed broadleaf-needleleaf forests occur (Iregmonger 1997). Species include cedar (*Cedrus deodora*), Chalgchoza pine (*Pinus gerardania*), Himalayan or Butan pine (*Pinus wallichiana*), Himalayan or



View of the forests in Nuristan. 2007. Photo: WCS, Nuristan Survey Team.

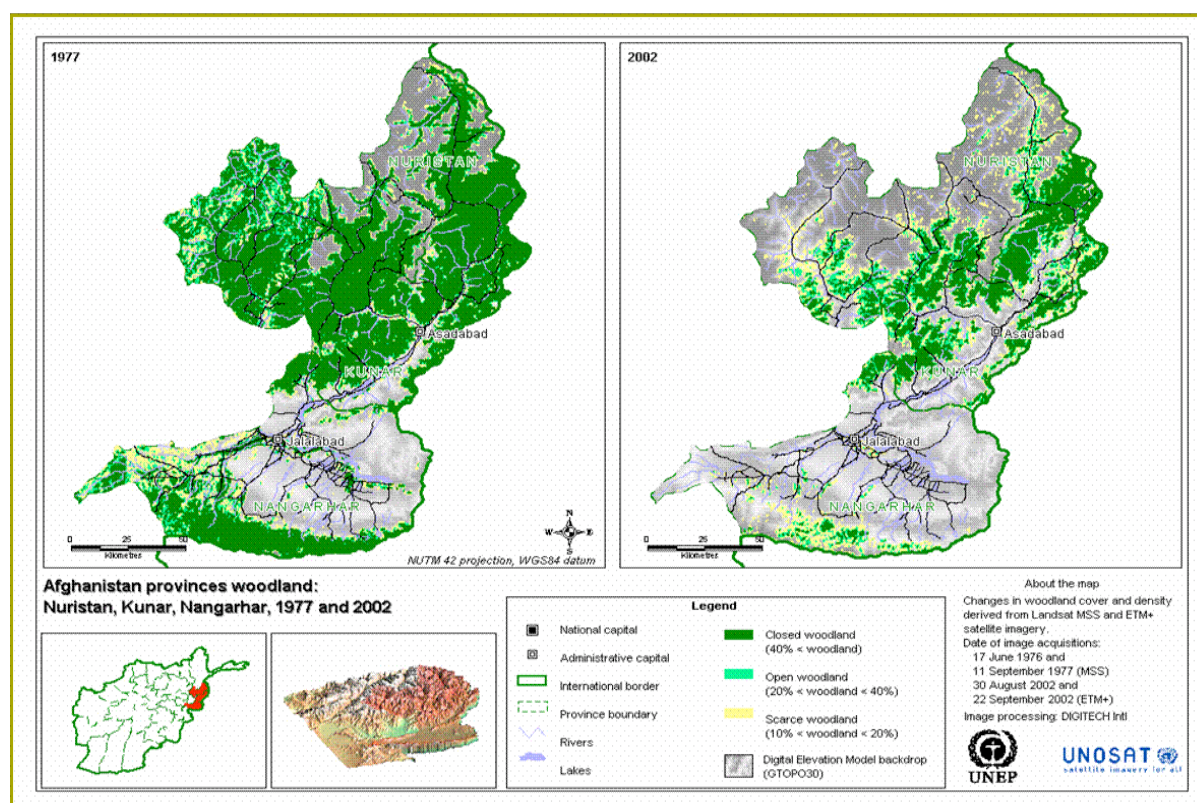
Morinda spruce (*Picea smithiana*), Himalayan fir or Talishpatra (*Abies webbiana*), Russian juniper (*Juniperus semiglobosa*), Chinara (*Platanus orientalis*), three species of Oak or Balot (*Quercus baloot*, *Q. dilatata*, and *Q. semecarpifolia*), and wild olive (*Olea cuspidata*).

Losses in the conifer forests since the mid to late 70s have been more than 50%. (UNEP 2003). The map in Figure 1 (p. 7) graphically represents this loss for three eastern provinces with important forest resources (Nuristan, Kunar, and Nangarhar). In the same report, UNEP states that as many as 200 trucks per day traveled the main road in Kunar carrying an estimated 200 hectares of forest. If each vehicle carries roughly 5m³, then the hectares figure assumes a much lower standing timber volume than our estimates of approximately 24m³ per hectare for juniper forests³ and 25-40m³ for oak. Unfortunately, there is no information currently available that would help refine either UNEP's or WCS's estimate of the ratio of harvest volume to potential forest cover loss. To fully understand the impacts associated with all forms of timber trade, more detailed information on the status of forest resources will have to be gained. Security in the region makes this a questionable venture for the moment.

The UNEP report also states that most wood (two-thirds) leaves the country in raw form for value-added processing in Pakistan, despite an existing and historical wood working industry in Afghanistan. Recent assessments of the trade in this area have not been conducted (primarily for security reasons), however timber trade surveys in Kabul indirectly indicate that the export market remains strong. The conifer forests appear to be under the continuing control of direct trade with Pakistan. Respondents to the timber trade survey reported a strong supply from two of the eastern provinces, but almost nothing from those with the most timber resources. Only two eastern provinces, Paktiya and Khost, figure prominently in our estimates for Kabul timber trade volumes; at 48% and 29% respectively. Paktika (2%) and Logar (1%), showed only relatively small market shares. Kunar and Nuristan, two of the most timber rich provinces in Afghanistan and the eastern forest region, are only marginally represented in the Kabul market surveys. Kunar only had 0.2% and Nuristan did not occur at all.

³ This figure is based solely on estimated volumes for juniper forests in areas with precipitation rates of 400mm per annum. Standing timber volumes are a function of several factors that have not been analyzed by this study. WCS is unaware of any surveys in Afghanistan that would provide exact data on standing timber volumes to allow for more accurate comparisons.

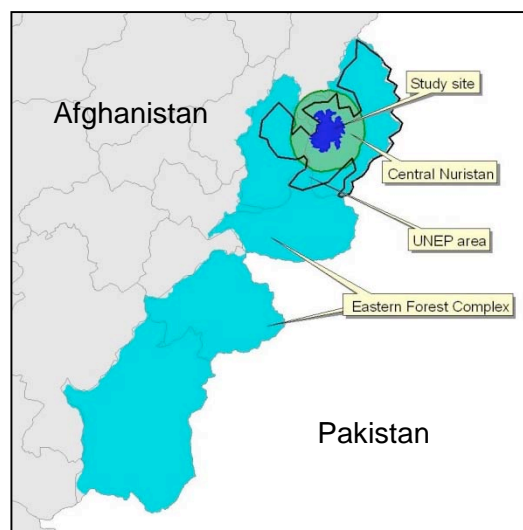
Figure 1: Forest cover change for selected provinces in Afghanistan, 1977 - 2002



Still, remote sensing data and other assessments indicate that Afghanistan's eastern forest region still contains a wealth of conifer forests not found anywhere else in the country; a region that with proper management could provide a sustainable supply of timber product (FAO 2006).

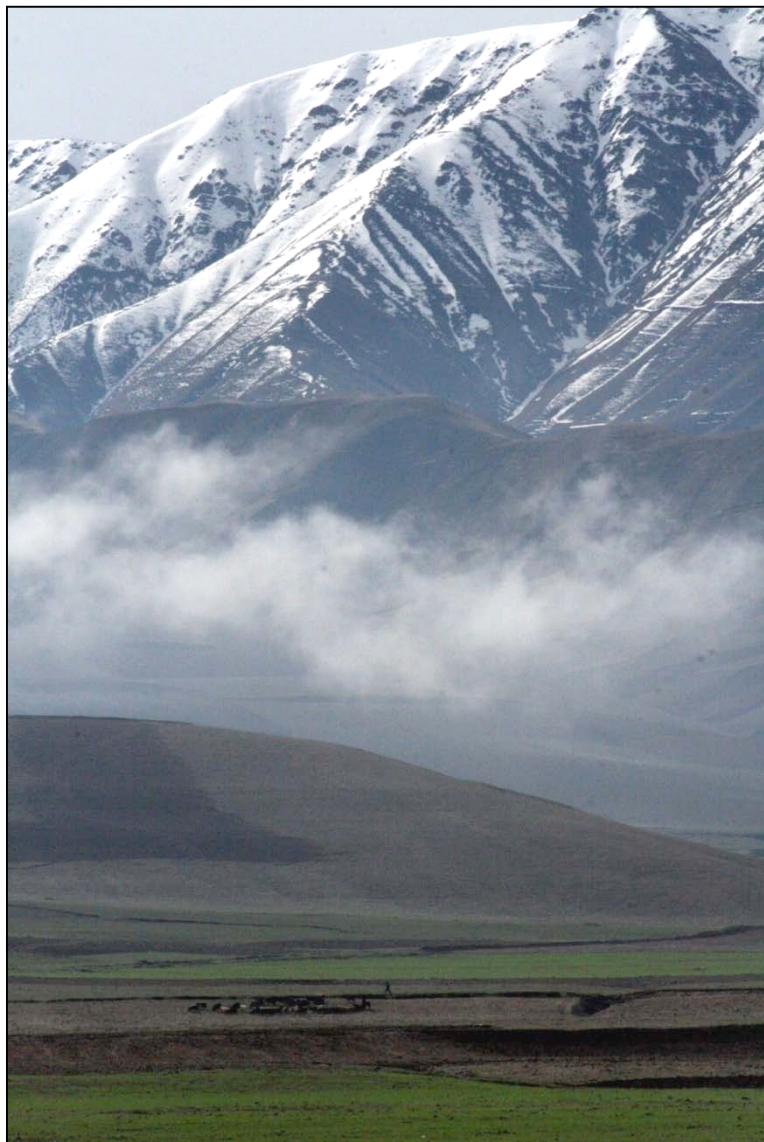
Figure 2: Map of WCS study site in eastern forest region of Afghanistan

Within these provinces, the WCS project has selected a pilot area for a detailed assessment of forest resources and uses, the selection of pilot communities for development work, and protection of critical areas as a national and regional priority. The selected site straddles the border between Nuristan, Kunar, and Nangarhar, with most of the areas lying within Nuristan (Figure 2). Within this area WCS has a number of ongoing activities including camera trapping and line transect sampling to determine the presence or absence of species and potential distribution (Vaidyanathan and Jathanna 2007). Socio-economic surveys have been implemented in selected areas in Nuristan to assist in understanding development challenges and opportunities. In addition, surveys have been conducted to determine hunter to non-hunter ratio, hunting practices, and harvest preferences. Some limited community work has begun including outreach on conservation issues in the region. As with other organizations, WCS activities are still being accomplished by proxy without the benefit of direct experience in the region.



CENTRAL HIGHLANDS AND THE HINDUKUSH

The Central Mountains, with higher peaks ascending toward the Pamir Knot, represent another distinct climatic region and thus define the boundaries of a different forest region in Afghanistan. From the Koh-e Baba Range to the Pamir Knot, January temperatures may drop to -15°C or lower in the highest mountain areas; July temperatures vary between 0°C and 26°C depending on altitude. In the mountains, the annual mean precipitation, much of



View of the Hindu Kush near Kunduz looking across agricultural fields that are numerous throughout the region. Trees are almost always associated with agro-forestry in this region. March 2007. Photo: WCS, J. Wingard.

which is snowfall, increases eastward and is highest in the Koh-e Baba Range, the western part of the Pamir Knot, and the Eastern Hindukush. Precipitation in these region is similar to the eastern monsoon area at about 400 mm per year. However, in most parts of the central mountains of the Hazarajat, precipitation occurs during the cold season, when plants are dormant, while the growing season corresponds with a relatively dry summer, resulting in highly limited forest cover.

True forests, such as those found in the eastern mountains, are almost without exception absent on the southern slopes of the central mountains. Juniper forests (mainly *Juniperus seravschanica*) and *Cercis* woodlands occur on the northern slope where spring rains appear to be enough to sustain some growth. This type of forest extends west to the Elburz (Alborz, q.v.) in northern Iran and Khorasan province in eastern Iran, fringing the highlands while gradually rising westwards, from about 1,400 to 2,900m in the east up to 1,500 to 3,600m in the west.

northern pistachio belt, a forest type that includes an estimated 200,000 hectares located primarily in Samangan and Baghlan provinces; formerly present in large areas in Balkh, Badghis, Takhar, and Kunduz. Pistachio (*Pistacia vera*) is native of Afghanistan. It ranges in central Asia from Turkmenia to Pamir-Alai and Tien Shan. In Afghanistan, Pistachio forests are distributed mainly in the Provinces of Herat, Badghis, Fariab, Balkh, Samangan, Jauzjan and Kunduz.

Relying on existing information, it has been reported that Afghanistan's pistachio forests have been seriously depleted (more than 50%) due to improper harvesting practices during the years of conflict, overharvesting for fuelwood, and drought. The same UNEP assessment

that documents severe losses to conifer forests in the east also shows substantial losses in the pistachio woodlands in the north. Satellite imagery shows 55% of the land cover in Badghis province in 1977 containing pistachio forests detected almost no trees in 2002. The same is true for Takhar province where 37% percent pistachio forest cover has been reduced to near zero in the same time frame. The continuing conflict has either prevented or significantly reduced local management capacity, and uncontrolled grazing of livestock is preventing regeneration (Newman 1996; ADB 2002).

This rather bleak picture is countered by other reports citing examples of functioning local management systems, some success at tree-planting programs, existing stocks exceeding 200,000 hectares (120,000 acres in Badghis and 80,000 in Samangan), a high market value for Afghan pistachios, and a strong market. One report states that “Afghanistan still exports 1,300 metric tons of the nuts annually, valued at about US\$130 million” (Ibrahimi 2005).

NORTHEASTERN MOUNTAINS – THE PAMIRS

The mountain regions of the northeast are subarctic with dry and cold winters. The Wakhan Corridor, where temperatures range from summer highs of 9° C to winter lows below -20° C, receives less than ten centimeters of rainfall annually. Permanent snow covers the highest mountain peaks. In the Little Pamirs that run along the border to northern Pakistan, the snow is often more than two meters deep during the winter months. Valleys regularly become snow traps as the high winds sweep much of the snow from mountain peaks and ridges.

The northeastern mountains have little to no forest cover. In some areas, sparse juniper stands may be observed. The harsh conditions and associated slow growth rates make their use as a source of fuelwood a cause for concern.



Lower Wakhan valley with limited vegetation located along the stream and sparse stands of juniper just visible farther up the slopes. April 2007. Photo: WCS, J. Wingard.

TURKISTAN PLAINS

The climate of the Turkistan Plains, which extend northward from the Northern Foothills, represents a transition between mountain and steppe climates. Aridity increases and temperatures rise with descending altitudes, becoming the highest along the lower Amu Darya river basin and in the western parts of the plains.

In this region, only irrigated agro-forests and planted trees can be found. Irrigated agro-forests are not identified on the map in Figure 3 (p. 11), but typically follow the numerous river valleys that cut through this mountainous country. Among these are four major river systems: the Amu Darya (the longest river in Central Asia, 1,100 kilometers of which are in Afghanistan); the Helmand (1,300 kilometers); the Harirud (650 kilometers in Afghanistan); and the Kabul (460 kilometers). With the exception of the Kabul river, all of these river systems terminate in internal drainage basins, many of which have only seasonal flow.



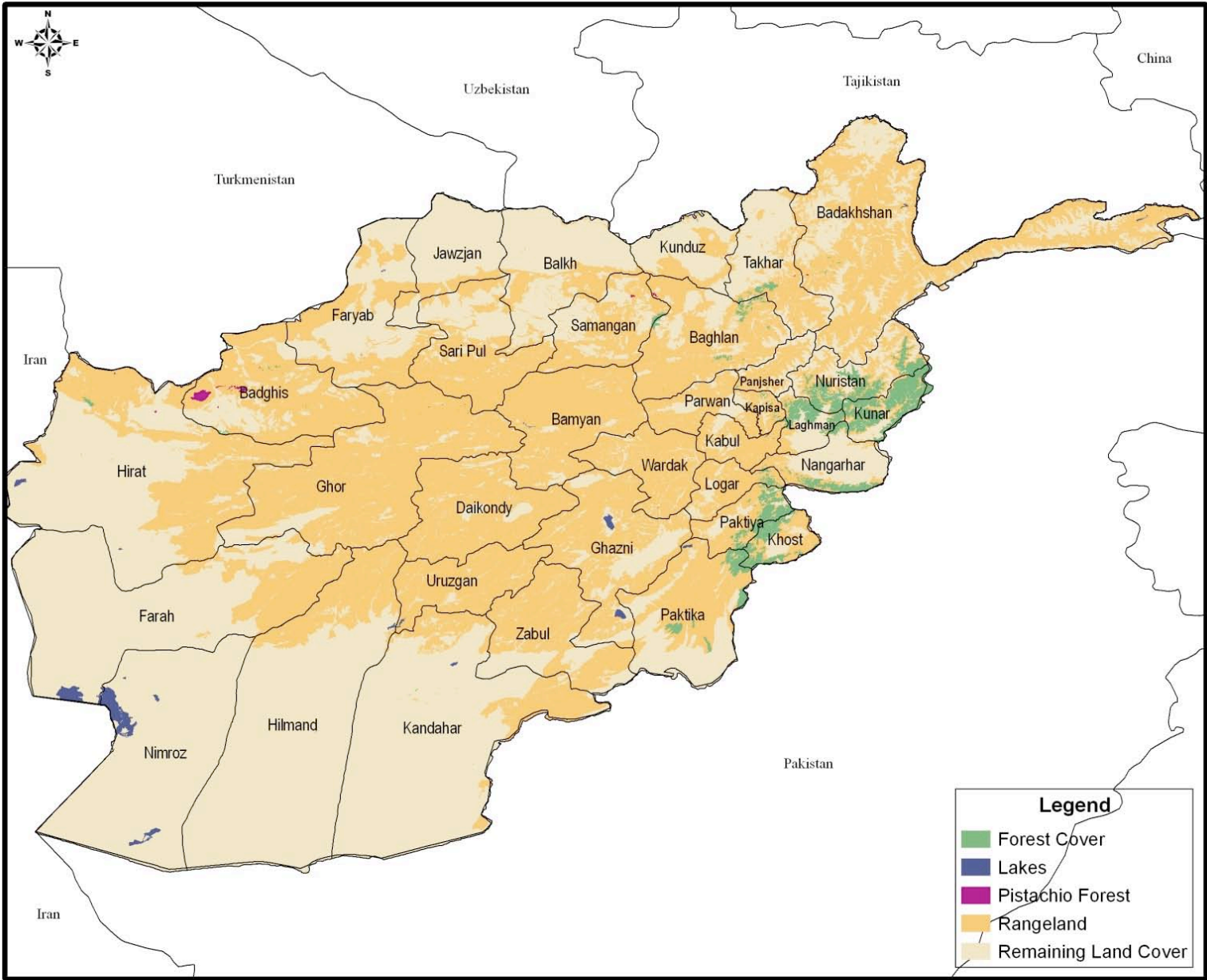
Rangelands in the Turkistan plains near Samagan. Trees are almost always associated with agro-forestry in this region. June 2007. Photo: WCS, J. Wingard.

Several tree species can be found in these managed areas, including at least one introduced species, Eucalyptus, as well as poplars, pines, and fruit trees like mulberry, walnuts, apricots, and almonds. (FAO 2006). It is this network of agro-forests that supplies large volumes of wood for markets around the country. Most of this is in the form of poplar rounds dedicated to the construction boom throughout the country.

The Kabul market alone receives agro-forest timber product from at least 16 provinces (including the eastern forests) and three other countries (Russia, Pakistan and Uzbekistan). The top five regional sources for timber product in Kabul are, in order of importance, Paktiya (48% of annual sales volumes), Khost (29%), Ghazni (8%), Bamyan (4%), and Wardak (3%). Additional sources, inside and outside the country, in order of trade volume include Russia (3%), Pakistan (2%), Paktika (2%), Logar (1%), Parwan (0.3%), Kunar (0.2%), Kabul (0.1%), Balkh, Uruzgan, Daikondy (<0.1%), Kunduz, Uzbekistan, Baghlan, and Sari Pul (<0.1% respectively) (Table 32, see Appendix p. 67).

Although firewood represents the majority of the annual sales volume (79%), construction wood has the highest economic value (76% of annual sales) with lombardy (*Populus nigra*) and himalayan (*P. ciliata*) poplar being the most common (17% of estimated annual trade volumes). It makes sense that wherever practicable, fast growing tree species (typically poplar varieties) are grown and harvested as a primary construction material. This type of trade is not cause for concern in terms of natural forest loss as it is a cultivated renewable resource. It may be that there are reasons for concern related to agricultural practices, but these questions are outside the scope of this survey.

Figure 3: Map of forested areas in Afghanistan



TIMBER TRADE SURVEY METHODS

This survey is one component of a larger assessment being conducted by WCS in the context of the Eastern Forests Program. The survey design is thus a function of the overall goal of understanding the status of the eastern forest resources, timber and NTFP uses and threats to conservation generally and specifically in WCS's selected study site (Figure 2, p. 7).

We began our assessment efforts in Kabul for several reasons. First, as a practical matter, developing and testing the survey method in Kabul allowed for more contact between members of the survey designers and survey team. Second, at the time the surveys began, security in the east had deteriorated to the point where travel in the region by international personnel was not advised, nor permitted. Third, canvassing wood bazaars in Kabul promised to provide a more complete picture of pressures on the east, but also supply much needed information on the timber industry potentially affecting communities in or near the proposed protected areas, Band-i-Amir and the Wakhan Corridor. Although the focus of this program is the eastern forests region, other WCS project components are being implemented in Band-i-Amir, to the west, and in the Wakhan corridor, to the north for which we anticipated this information would have direct relevance.

NOTE ON OFFICIAL DATA SOURCES

An original intent in this effort was to obtain information from several official sources including customs trade data, enforcement records, official harvest quotas issued by the responsible agencies, and historical records for forest distribution from the Ministry of Agriculture and Irrigation. WCS intended to compare these survey results and amplify our description and discussion of historical timber trade. For several well known reasons, we were unable to obtain this data. The basic reason is that the data we were looking for was either never kept or lost during the many years of conflict. This is not a surprise as most of Afghanistan's official records were destroyed during the 23 years of conflict from 1978 to 2001. If it ever existed, this data is gone and cannot be recovered.

Efforts to obtain such information will nonetheless continue as obtaining it will still have value for future assessments. Knowing what types of records were kept and what information they contain, will assist in developing recommendations for improving this aspect of forest management. The information, even if incomplete, will still allow us to make some comparisons where absolute volumes are not the primary interest. At a minimum, we would anticipate learning more about several components of historic and current trade, including they types of tree species traded, general geographic sources, relative amounts and types of products (round logs, sawn lumber, collected or cut fuelwood), and taxation rates. With this information in hand more can be said about the trends in Afghanistan's timber industry and management recommendations better formulated.

WOODLOT SURVEYS

This survey consisted of one primary and two supporting surveys, all of which were designed to determine timber trade types, volumes, values, sources, and, where possible, trends. The primary surveys included direct observation and questioning in the wood markets of Kabul. The supporting surveys included 1) recording of wood transportation into Kabul city and 2) random sampling of fuelwood consumption of bakeries, restaurants and bath houses.

Using a local staff of 6 trained surveyors, WCS completed 800 market surveys, including 114 wood bazaars, 1,719 woodlots, spent 15 days at designated areas along the main transport routes into Kabul, and questioned more than 100 bakeries, restaurants and bath houses. In total, the entire survey was conducted during a four-month period from November 2006 to February 2007.

The general approach is a function of the peculiarities of the timber trade in Kabul and, as designed, may not be applicable in other areas. Kabul's timber trade flows through the four main gates to the city at the north, south, east, and west ends. The wood found in the bazaars located in these areas of the city comes primarily (not exclusively) from the provinces adjacent to them. So, for example, the east gate bazaars, receive timber primarily from Nuristan, Kunar, and Nangarhar; the west gate, takes trade from Bamyan and Wardak; the north gate receives timber from Laghman, Kapisa, Parwan, Panjshir, and Badakhshan; and the south gate takes trade from Ghazni, Logar, Paktiya, Paktika, and Khost. Wood harvested in several other provinces did not appear in the survey. These include Herat, Badghis, Faryab, Ghor, Samangan, and Takhar. A major component of the survey design, therefore, included an emphasis on surveying markets associated with the gates.



Stripping bark from Chinar poles. Bala Hasar Wood Bazaar, Kabul, Afghanistan. October 2006. Photo: WCS, J. Wingard.

To include calculations on firewood trade, the approach was modified slightly. Firewood is often sold by individuals in woodlots located throughout the city. To adequately cover these, we created a grid overlay for the whole of Kabul and employed a random selection process in each grid. The same grid and sampling method was applied to the supporting survey of bakeries, restaurants, and bath houses.

Woodlot Survey Questionnaire

For all woodlots, whether they sold construction wood, firewood, or both, the team developed and tested a simple survey form designed to quantify the types, species, values, volumes, and sources of wood sold in Kabul's wood bazaars (Figure 12, p. 51). To do this, the questionnaire is broken up into four major columns identifying:

1. Wood species common and scientific names
2. Wood types, quantities and measurements
3. Sales data and turnover rates, and
4. Geographical sources

1. Wood species common and scientific names:

To identify wood species, common and scientific names, the team relied primarily on information provided by the traders, but also independently verified through direct observation. All common names were recorded on site, with scientific names entered after verification using a reference table prepared by the survey team (Table 1, p. 20)

2. Wood types, quantities and measurements:

The primary goal of the survey was to quantify the overall types and volumes of wood and later compare these to estimated growth rates for the tree species found on the market, and eventually the estimated volume of resource available. The comparison part of this analysis will occur at a later date as forest assessment data is gathered through remote sensing data and field surveys in selected areas.

“Round logs” refers to the sections of a tree (tree bole) when subdivided into short lengths either through cross cutting a felled stem or through subdivision of the bole or branches of a standing tree. This includes all coniferous and non-coniferous species in the rough, whether harvested from natural or agro-forests, with or without bark, and destined only for construction uses. It does not include wood that has been split, roughly squared, or is in other forms such as roots and stumps.

“Sawn lumber” includes any wood species that has been milled to any dimension, or roughly squared, such as pine and cedar barks.

Fuelwood consists of smaller, irregularly shaped branches, low quality round logs, roots and stumps, either whole, split, or cut to size for burning. Estimates do not include firewood derived from round logs used for construction for a period of time (years) and then converted for use as firewood. Given the



Milling pine barks into planks. Shashaid Bazaar, Kabul, Afghanistan. October 2006.
Photo: WCS, J. Wingard.

volume of construction wood, this is probably an important source of firewood. However, we do not have any data on the turnover volumes or rate to estimate what this source means for overall fuelwood harvest rates.

Survey results showed that about two thirds of the wood found at Kabul’s woodlots was firewood (79% compared to 17% construction wood; mostly in the form of round logs). To a lesser extent, sawn lumber is also sold from the same woodlots.

3. Sales data and turnover rates:

The survey design calls for the collection of sales data as means of measuring the value of trade to the individual trader and the economy generally. With additional data from different areas, we will be able to further assess the value of this trade at various points along the trade chain. Four components of information were gathered during the survey including the sales unit, price per unit, the quality of the timber for that unit, and an estimate of the number of units sold. Sales unit refers to the volumes in which the particular timber product is sold.

In Afghanistan, **firewood** is priced by two different weight units called:

- *kharwar* (roughly equivalent to 560 kg); or
- *seer* (approximately 7 kg).

This presents some problems in determining actual wood volumes as discussed in the next section. However, rather than have researchers calculate kilograms or estimate cubic meters on site, the form required only the entry of the unit and the unit price.

Round logs and some dimensional lumber are priced by the:

- **piece**, as a function of size (i.e., length and circumference, or length, width, depth) and quality; or
- **kuri**, which is a bundle of twenty (20) pieces, with the price also a function of size and quality.

Less often, **dimensional lumber** is priced by the:

- **meter length** with no bundling of the price.

On the survey form, surveyors were asked to list the price in Afs, the unit to which the price corresponded, (*kharwar*, *seer*, piece, *kuri*, or meter length) and the quality.

To calculate prices/m³ for different wood species, we had to consider wood quality in addition to the type of wood and species. Quality of wood was recorded as “high,” “medium,” or “low,” with no apparent standard definition to distinguish them. Although this definition is not precise, it was assumed that log quality is based in part on the dimensions of the wood (length, straightness, thickness). This is consistent with timber markets worldwide where log quality for most species is determined by stem features in the following categories:

- stem form straightness, sweep, bend, lean
- branchiness presence and size of knots, limbs, forks, multistems
- damage scar defects, browsing, extraction

However, our results not only showed a wide variation of prices between species but also within species and for most cases we were unable to link the recorded quality of the wood or its dimensions to consistent price ranges. Obviously, a whole set of combined attributes plus different market locations in Kabul (cheap versus expensive parts of the city) are decisive for determining price levels which are not reflected in the simple recording of ‘high’, ‘medium’, and ‘low’ quality. This is especially true for construction wood species; in contrast, responses to firewood pricing show substantially better consistency and confidence intervals are within an acceptable range. (see Note on Data Quality, p. 19). Although for this reason some caution must be exercised in using the value figures given here, the results nonetheless indicate the economic importance of the respective wood species found in Kabul and are therefore valuable in understanding the market’s overall potential and impact.

For purposes of this rapid assessment the only option to measure turnover rates was to ask traders how much of a given timber product they sell on a monthly basis. As no

records are kept, or at least no one was willing to show their records, there is no way to verify what we were told. However, given the current ban on logging and the reluctance to share information, we felt that if this introduced any bias into the results, it would likely be a negative bias – causing us to underestimate rather than overestimate trade. Still, responses to this question were surprisingly consistent with a confidence interval of >0.1 and therefore have a higher degree of trust than originally anticipated.



Bala Hasar Wood Bazaar, Kabul Afghanistan. October 2006. Photo: WCS, J. Wingard.

4. Geographical sources:

One of the major goals of this survey was to estimate the pressure timber trade is having on resources in the eastern forest region of the country. Knowing the geographical source of the wood, combined with our calculations of total volumes and turnover rates, is critical to this effort.

This portion of the questionnaire relies entirely on the statements of the traders surveyed and thus incorrect replies cannot be ruled out. The survey team asked respondents to be as specific as possible in identifying the geographical source, but in most cases the province name was the only information available. Additional surveys in selected locations and independent surveys of transportation routes are necessary to eventually attempt to verify the statements based on known locations of certain species (e.g., cedar can only come from a limited area in the eastern forest region). Without actual surveys in the source provinces, the reliability of the results remains uncertain to some extent.

A supporting survey of wood transport into the city has been used to compare our volume estimates achieved from the market survey. Both surveys appear to be consistent. Pure volume estimates convert to approximately 400 trucks per day based on a measured average load of about 5m³. The transport survey observed between 80-100 trucks per day at each of the entrances (four primary entrances), with a final estimate of approximately 300-400 trucks per day. However, this still might be an underestimate as different routes might be taken into the city other than the four main roads entering Kabul and were missed by our survey.

Collection of Macro-Market Data

To assist with the extrapolation of survey data, surveyors recorded information on the overall structure and composition for the entire timber market in Kabul, what we have called here the “macro-market.” As it is focused only on Kabul, this does not necessarily reflect the reality of the timber market in the country as a whole, but it is intended to help place the woodlot surveys in a larger context. However, observations from other areas outside the context of this survey seem to indicate at least strong similarities in the structure of wood markets throughout the country. The following information for each wood bazaar has been recorded:



Woodlot in Bamiyan province showing the same organization and product structure observed in the Kabul wood markets. June 2007. Photo: WCS, J. Wingard.

- the name, city district and GPS position of the bazaar, and
- the number of woodlots that sell only construction wood, firewood, or both.

The survey team documented the existence of at least 198 wood bazaars located within the city limits of Kabul, of which 58% (114 bazaars) were surveyed (totaling in 1,719 woodlots). Of the bazaars surveyed, the average number of woodlots was 15, with the lowest being one (1) and highest one hundred and ninety four (194), with a sample size of 100% for each bazaar (a breakdown of surveyed wood bazaars and their timber product composition is given in the Appendix, Table 6).

DATA ANALYSIS METHODS – WOODLOT SURVEYS

To estimate the probable impact of timber trade on forest resources, this analysis needed to derive a standard measure of volume from the many given by traders. As mentioned in the Survey Methods section, wood is sold in many forms in Afghanistan including by the:

- weight – for firewood (measured in *kharwar* – 560 kg, or *seer* – 7 kg);
- length and mid-circumference priced by the piece – for round logs (measured in meters and centimeters); and
- length, width, and thickness priced by the piece or meter – for sawn lumber.

To obtain a comparable measure for each form, we opted for conversion to cubic meters as one standard in the timber industry. However, to calculate cubic meters from the measures reported required several different computations, which are described in the following sections. Using these, we were able to roughly calculate the total volume for each timber product and tree species in stock, as well as total volume in stock for each woodlot.

Round Log Volumes

The only accurate method to measure the volume of wood requires a xylometer, which determines volume based on water displacement. This would have been impossible in the context of this survey. Round log volumes were therefore determined by other means which involve measuring log diameter and length, and making some assumptions about log shape.

One of the most commonly used formulae for estimating the volume of frusta (and hence logs) was created by Huber. Huber's formula assumes that the average sectional area of a log is found at its mid-point. While this may not always be true, this formula has become the common basis of log tables giving log volume for various lengths and centre diameters or girths (Wood and Wiant 1990, Wiant et al. 1992, Patterson et al. (1992)). Ellis and Duff (1973) in New Zealand found Huber's formula to be more robust than other formulae when long intervals between measurements are used. They point out that even with an interval of 10m or more, underestimation by Huber's formula was only about 5% of the total volume. Inclusion of measurements from the small end and the irregular butt end into the calculation, as required by Newton's and Smalian's formula adds only little value to the result compared to only using measurements from the mid-point. The time required to take these additional measurements on each log would have been cost prohibitive. For purposes of this assessment, we therefore opted to use Huber's formula, assuming that any bias would result in an under estimation:

$$V = \frac{\pi d^2 l}{4} \left(1 + \frac{b}{3} \right)$$

where v = volume, d = diameter at the mid-point, l = length from base to tip, and b = a constant which varies with shape, with 0 for a cylinder, $2/3$ for a paraboloid (third degree), 1 for a paraboloid (second degree), 2 for a conoid, and 3 for a neiloid. In our assessment, we found the poles relatively uniform in shape, with only slight flaring on the butt end. From visual inspection the wood was classified as conoid and the following formula was used:

$$V = \frac{\pi d^2 l}{4} \left(1 + \frac{2}{3} \right)$$

The actual survey work was expedited by the organized structure within the wood bazaars. Standard measures for round logs used within the wood industry in Afghanistan are by length and circumference at the mid-point. Round logs in all woodlots surveyed are physically segregated into groups and priced according to length, circumference, and quality. Surveyors were able to easily verify lengths and circumferences directly by placing a tape measure against randomly selected logs in a given grouping. Log lengths were recorded in meters on data sheets provided to the survey personnel. We found the groupings by length

and circumference to be reliable to within +/-1%, and considered this sufficient to rely on for purposes of this survey, although we continued independent verification on randomly selected samples in each woodlot surveyed.

Sawn Lumber Volumes

Sawn lumber volumes were less complicated. Like round logs, this type of lumber is also stocked in separate areas to facilitate trade. Surveyors were able to verify lumber dimensions directly as was done with the round logs. Log lengths were recorded in meters on data sheets provided to the survey personnel. We used the following simple formula to calculate the volume:

where v = volume, l = length from base to tip, h = height, and w = width.

Fuelwood Volumes

Fuelwood in Afghanistan is sold by weight, either in units called “seer” (pronounced “sehr”) or “kharwar.” One seer is equal to 7kg; one kharwar, 560kg. In the process of data entry, total weights reported by traders were converted to kharwar to make further conversions simpler. To translate kharwar to cubic meters, standard conversion tables were used that provide ratios for kilograms per cubic meter for various tree species. For example, spruce (*Abies webbiana* var. *pindrow*) has a conversion ratio of 450kg per cubic meter; oak species are typically 750kg.



Survey team verifying wood circumference. Shashaid Bazaar, Kabul, Afghanistan. October 2006. Photo: WCS, J. Wingard.

However, it was not possible to find exact conversion rates for all species found on the market in Afghanistan. The weight to volume conversions we did find were created for species that occur in the United States and many of the species we encounter in Afghanistan are not included. For species not found on any list, but which are similar to other species encountered, we used the value for that similar species. For example, chinar is not listed in any conversion table. It is, however, most closely related in density to poplar, which has a conversion rate of 450kg per cubic meter. For species not listed and where we were uncertain as to which species it would most likely be similar to, we used the low-range value of 450kg/m³. Pine and cedar have conversion rates between 400-600kg/m³. Species whose weight to volume conversion could not be verified include Greek juniper and willow. In this instance, we again used the low value of 450kg.

TIMBER TRADE SURVEY RESULTS

Despite the substantial loss of forest cover in past years (UNEP 2003), Afghanistan's timber trade still represents an important economic sector for the country. Measured against its gross domestic product from the year 2007 (est. as \$8.4 billion; Source: US Department of State), the Kabul timber trade alone is the equivalent of 2% of the country's economy. Sales volumes and values in other parts of the country and cross border trade to Pakistan would add significantly to this figure, making timber trade one of the more important single resource uses and economic questions overall.

In this section, we outline the four main results from the survey describing the various species available and their associated uses, the composition of the Kabul wood markets, sales volumes and values, and finally the regional sources for timber trade overall.

NOTE ON DATA QUALITY

We have a high confidence in our estimates of average stocking volumes and turnover rates for timber traded in Kabul markets. Stock volumes are derived from direct observation and independently verified by our survey team. Responses are consistent and confidence intervals for these estimates are strong. Monthly turnover rates are based on reported figures and we were not able to verify actual sales volumes. However, confidence intervals for these figures are still strong and only marginally higher than the observed stock volumes.

Some caution must be exercised in using value figures as they are reported prices only and are not verifiable against any other independent source. This is mostly a concern for construction wood estimates. In our survey, recorded prices for cubic meters of construction wood varied widely not only between species but also within species depending on size and quality (Table 3, p. 28). For most construction wood species (e.g., cedar, poplar, larch, willow, pine, fir, and spruce) we were unable to link the recorded quality of the wood or its dimensions to consistent price ranges. Obviously, a whole set of combined attributes plus different locations of markets in Kabul (cheap versus expensive parts of the city) are decisive for determining prices which are not reflected in the simple recording of 'high', 'medium', and 'low' quality. Responses to firewood pricing show substantially better consistency and confidence intervals for prices/m³ for fuelwood such as oak and juniper are within an acceptable range (*Qercus dilatata* – CI: 0.7; *Q. baloot* – CI: 0.5; *Juniperus excelsa* – CI: 0.2).

In our firewood calculation, we had to give up the initially attempted differentiation between collected downed wood versus live harvests due to a lack of clarity in responses. Our original goal was to not only estimate total figures, but also to refine our understanding of different types of impacts likely associated with different firewood collection practices. The overharvesting of live trees not only reduces forest cover, it also has well documented impacts on soil and watershed quality, aquatic species, and wildlife. However, even dead wood plays an important role in nutrient cycling and the overall forest ecosystem; making this distinction would have allowed us to say more about the relative types of impacts. Unfortunately, we were unable to obtain clear responses to what extent fuelwood constituted the harvest of live trees or consisted of down and woody debris collected from the forest floor. We were therefore forced to combine both categories. This still allows for assessments of the total market and at least some reasoned guesses at the likely impacts.

TIMBER SPECIES AND USES

The survey found a variety of species available on the market in Kabul, but relatively few uses. During our survey we found 13 different species including Deodar cedar, two species of oak, Greek juniper, three species of poplar (Lombardy, Himalayan, and white), Siberian larch, one willow species, West Himalayan fir, two pine species (Chalghoza and Himalayan/Bhutan), and one spruce species (Table 1). One species, traders referred to as Pakistan poplar, could not be identified, but reportedly has its origin in Pakistan and is imported into

the country (Table 31, see Appendix p. 66). To calculate the total value of timber trade in Kabul regardless of source, we included these figures in our calculations.

Table 1 shows the typical use of the respective species for international and domestic trade, based on our survey results and on interviews with wood traders. For the most part, species on the market in Kabul have only one or two uses, with the majority dedicated to the booming construction market in Kabul, although some also find use in furniture and wood carvings. At least two species double as firewood and construction wood (juniper and willow). The only species not used for construction in the domestic market include cedar and oak. Cedar is used exclusively for furniture, while oak is used only for firewood.

Afghanistan's export market, as reported by traders, show less variation in species' use, at least with respect to its demands on Afghan wood products. Timber mostly leaves the country in raw form reportedly for construction purposes. This does not reflect value-added processing outside of Afghanistan, nor does it reflect trade of possible timber product, which is already processed in Afghanistan but exported through a separate trade chain and therefore not surveyed. For example, besides its use as timber, Chalghoza pine constitutes an important species for the national and international NTFP market. Pine kernels are eaten raw or roasted and have a high food value. This and other similar values are not recorded by the timber trade survey.

Table 1: Table of tree species in Kabul wood markets and their trade use

Scientific name	Dari common name	English common name	International trade					Domestic trade				
			Construction	Furniture	Wood carving	Firewood	Fruits/ nuts	Construction	Furniture	Wood carving	Firewood	Fruits/ nuts
<i>Cedrus deodara</i>	Lamanza (لمنزه)	Deodar cedar		X					X			
<i>Quercus dilatata</i>	Darakht-e-marō (مارو درخت)	not listed									X	
<i>Quercus baloot</i>	Balot (بلوط)	Oak									X	
<i>Juniperus excelsa</i>	Archa (ارچه)	Greek juniper	X					X			X	
<i>Populus nigra</i>	Chinar Arhar (چینار عر)	Lombardy poplar	X					X	X			
<i>Populus ciliata</i>	Chinar Rima (چینه چینار)	Himalayan poplar	X					X		X		
<i>Populus alba</i>	Chinar Safit (چینار سفید)	White poplar	X					X		X		
<i>Larix sibirica</i>	Khar-e-rosy (روس ی خار)	Siberian larch	X	X				X	X			
<i>Salix wallichiana</i>	Bid-e-watani (وطنی دبب)	Willow						X			X	
<i>Abies webbiana</i> var. <i>pindrow</i>		West Himalayan fir						X				
<i>Pinus gerardiana</i>	Jalghuza (چل غوزه)	Chalghoza pine					X	X				X
<i>Pinus wallichiana</i>	Nishter (نیشتر)	Himalyan or Butan pine						X				
<i>Picea smithiana</i>		Himalayan spruce						X				

COMPOSITION OF KABUL WOOD MARKETS

To get a better understanding of the market structure and its economic relevance for traders we examined the proportionate share of small, medium and large woodlots. Results show that the majority of the timber trade at least in the Kabul market is occupied by small, individual traders and few companies with large sales volumes. This translates into a market structure that reflects the direct dependence of a large number of family households on timber resources for their livelihoods. Anecdotal information and observations from other parties suggests that the more lucrative markets in Nuristan and Kunar, in particular cedar trade, are indeed controlled by relatively few traders. This information should be verified, but was beyond the capacity of this survey primarily for security reasons.

Woodlots in the Kabul markets are organized as stand-alone operations or combined into one of the many larger wood bazaars. For the most part, construction woodlots belong to larger bazaars, whereas many firewood lots are individual plots scattered throughout the city. In our survey of 114 wood markets, the average number of woodlots per market is 15, with the lowest being 1 and the highest 194.

Readily apparent is the fact that for the most part individual woodlots neatly divide themselves along product lines, with most lots surveyed dedicated to the marketing of one particular product, either construction or fuelwood. Approximately two thirds of the lots surveyed, sell exclusively firewood (66%, 1,141 of 1,719), compared to 30% (516 of 1,719) that sell only construction wood, and another 4% (62 of 1,719) that market both.

Our survey shows that most woodlots (78%) have small amounts of wood in stock (averaged 17.2m^3 , CI: 0.5), and are thereafter classified as small⁴. Another 15% of the lots are classified as medium with an average stock volume of 50.6m^3 (CI: 1.1). The smallest percentage (7%) is placed in the 'large size' category reporting an average stocking rate of 102.5m^3 (CI: 5.9; Figure 4). The latter category combines relatively few lots showing a wide variation of stock volumes, which is reflected in the associated higher confidence interval. Some of the lots surveyed are so large as to create another class of their own (max: 415.9m^3 in stock) and for purposes of estimating reliable average trade volumes were treated as outliers and eliminated from calculations.

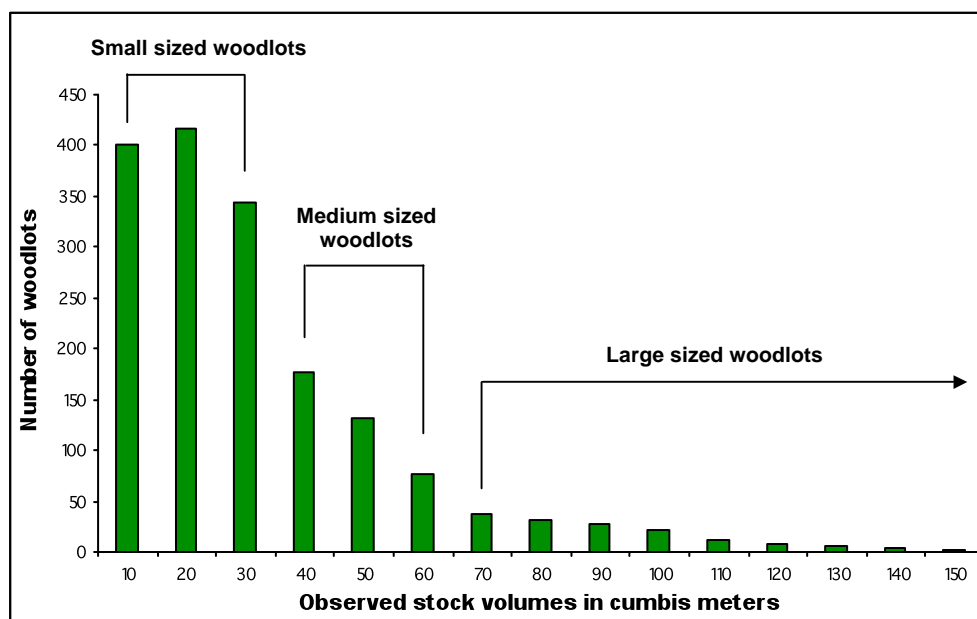
In order to depict woodlot size distribution based in stock volume and turnover rates we sorted the surveyed woodlots depending on their stock volumes (turnover rates, respectively) in intervals of 10m^3 . Figure 4 shows the number of woodlots for each interval (same for Figure 5; based on turnover rates). For example, we found 400 woodlots with a stock volume of less than 10m^3 . Even if woodlots with stock volumes of more than 400m^3 were recorded, we only depict woodlots here with stock volumes (and turnover rates) of less than 150m^3 as woodlot numbers for these higher stock volumes/ turnover rates are only few and would not add significant information to understand the prevalent picture. Intervals combined for each category of small, medium and large sized woodlots are indicated in the graphs.



Poplar is mostly sold in round logs for construction purposes. Shashaid Bazaar, Kabul, Afghanistan. August 2006. Photo: WCS, J. Wingard.

⁴ In the process of gathering and analyzing the data, researchers identified the potential to classify woodlots as large, medium, or small based on observed stocking rates and monthly turnover rates. The classification used here is not used in the local industry, but nonetheless appropriate for understanding how each lot contributes to overall timber trade volumes and values.

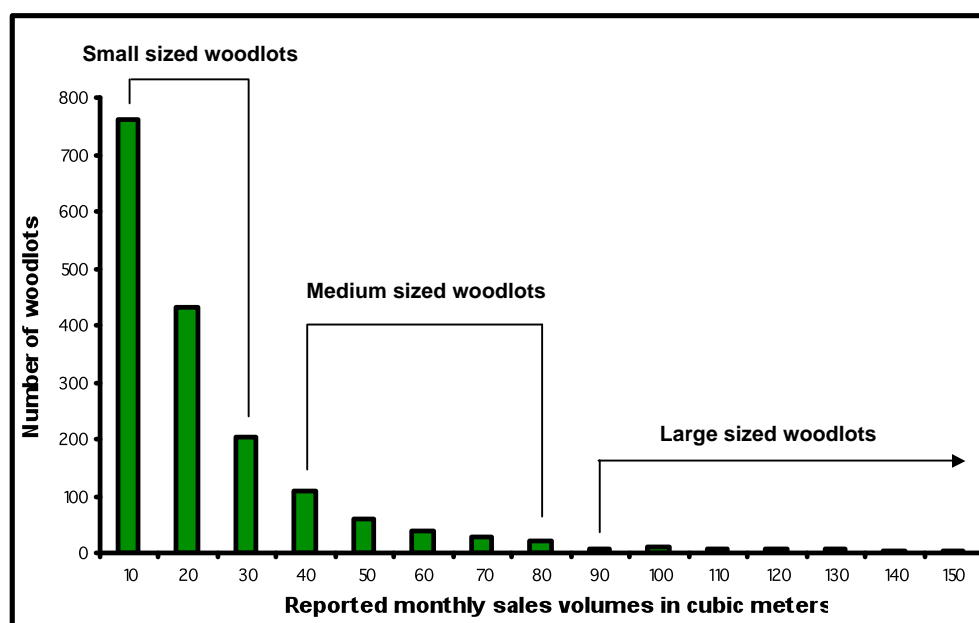
Figure 4: Number of woodlots in Kabul grouped by observed stock volumes in cubic meters



Note: Figures only show results for the actual surveyed 58% of Kabul wood markets.

The analysis of reported monthly turnover rates results in a similar division of lots as small, medium and large (Figure 5), with a slight shift to a larger number of small woodlots and a smaller number of medium and large woodlots. Just as the stocking rate shows a majority of lots being classified as small, so does the turnover rate. Small woodlots make up 88.3% (*cf.* 78% for small woodlots based on stock volume) and report an average turnover of 12.5m³ per month (CI: 0.5). Medium size woodlots account for 9.3% of all lots (*cf.* 15% for the same classification based on stock volume), with reported average turnover rates of 57.2m³ per month (CI: 2.1). The slightly higher confidence interval for the last category (*cf.* CI: 1.1 for the medium sized woodlots based on stock volume) reflects its greater inconsistency resulting in a combination of five 10m³ intervals compared to only three for the same category based on stock volumes (Figure 4 and Figure 5). The number of large woodlots is only 2.5% (average 120.8m³ per month); a noticeably smaller percentage than the classification based on observed stock volumes (7%). The classification of this last category based on turnover rates suffers from the same inconsistency found in the classification based on observed stock volume, as reflected in a higher confidence interval (CI: 7.9). Some of the woodlots in this category were removed as outliers because of their exceptionally high turnover rates, the highest being 616m³ per month.

Figure 5: Number of woodlots in Kabul grouped by reported monthly turnover volumes in cubic meters



Note: Figures only show results for the actual surveyed 58% of Kabul wood markets.

OVERALL MARKET VOLUMES AND VALUES

With estimated annual sales volumes and values as high as 745 thousand m³ worth as much as \$175 million, the timber trade market in Kabul alone represents an important business based on natural resources. Volumes mentioned here translate into more than 400 trucks loaded with an average of 5m³ of wood arriving in the city on a daily basis.

We documented the existence of at least 198 wood markets in the city limits, of which 58% (114 markets, 1,719 woodlots) were subsequently surveyed. However, the total number of wood markets and its associated lots are not absolute as a number of woodlots are only temporary due to frequent shifting and seasonal change.

Trade Volumes

The overall volume of wood observed in stock of the 58% surveyed woodlots was more than 51.6 thousand m³. Extrapolated to the entire market this figure amounts to 89 thousand m³. Based on reported monthly turnover rates we estimate annual sales volumes for the entire Kabul market as high as 745 thousand m³ (432.6 thousand m³ for the actual surveyed 58% of the market).⁵ Thus an average of 68% of the observed stock volume was sold each month, which means in other words, if a trader stocked 100m³, then the average sales would be 68m³. We recognize that these are only reported volumes with no independent measure for corroboration. However, responses on this question were consistent with a confidence interval of below 0.1. If the turnover rates can be trusted, this translates into more than 400 trucks loaded with an average of 5m³ of wood arriving in the city on a daily basis.

⁵ We are aware of the seasonal change of firewood consumption for households, however the need for firewood for bakeries and restaurants stays the same throughout the year. As figures for the latter are not covered by our survey as for the most part they obtain firewood directly from traders and don't buy it on the market, we are confident that our estimates for annual turnover rates do not result in an overestimation.



Typical stand-alone firewood lot in Kabul. Winter 2007. Photo: WCS, Survey Team.

The largest share of wood traded in Kabul is firewood (78.5%) with an estimated total volume of more than 585.4 thousand m³ per annum for the entire wood market (339.5 thousand m³ for the surveyed 58% of Kabul wood markets). Fuelwood is mainly comprised by oak and juniper, two slow growing species which are drawn from the eastern forest regions. Construction wood, in comparison, accounts for only 21.5% with an estimated total of 160.4 thousand m³ for the overall market (93 thousand m³ for the surveyed 58%; Figure 6; Table 11, see Appendix p. 61).

As high as the volume for firewood might be, it is still likely to be an underestimate. The National Environmental Protection Agency estimates that roughly half of all energy needs in the country are met by firewood⁶ and ADB (2006) even claims that as much as 85% of Afghanistan's energy demand is satisfied by wood. However, rough calculations⁷ based on our results for Kabul indicate that annual trade volumes only provide enough fuel for little more than 40% of Kabul's population.

Trade Values

The overall value of timber in stock was \$15.3 million for the 58% of surveyed woodlots. Referring to the entire market we estimate an overall value of \$26.3 million. Based on reported monthly sales rates, a total of \$175 million per annum was recorded (\$101 million for the surveyed 58%). At this level, timber trade in the Kabul market generates an economy equitable to 2% of the country's gross domestic product (est. as \$8.4 billion for 2007; Source: US Department of State). This figure does not yet reflect the true value of cedar trade, as our survey apparently only covered a marginally portion of the overall country's trade, nor does it reflect direct cross border trade with Pakistan from at least three timber rich provinces (Nangarhar, Kunar and Nuristan), or timber trade in other parts of the country. The addition of these sales values certainly still adds significantly to this estimate, likely making timber trade one of the leading factors in the country's economy based on licit natural resources. This is an even more surprising finding considering the little forest cover left (2%) in Afghanistan and the therefore only small margin for a robust timber related economy.

In contrast to timber trade volumes, the central theme for trade values is not firewood, but construction wood. The latter is the most valuable wood type found in Kabul markets. Compared to mean prices/m³, firewood only sells for approximately 20% of the prices gained by construction wood (firewood – \$70.1/m³; construction wood – 333.8/m³). It accounts for 76% of turnover rates, with an estimated overall annual sales value of \$132.4 million for the entire Kabul market (\$76.8 million for the actual surveyed 58% of the market; Figure 6; Table 12, see Appendix p. 61). Mostly comprised by fast growing poplar species (81%), which are grown along irrigation canals wherever practicable, the primary source of construction wood thus is Afghanistan's agro-forest system. This type of trade is not cause for concern in terms

⁶ The remainder is supplied gas, oil, and hydroelectricity. There are dams and hydroelectric stations on the Kondozi, Kabul, Arghandab, and Helmand rivers <http://www.afghanistans.com/Information/Economy/Energy.htm>.

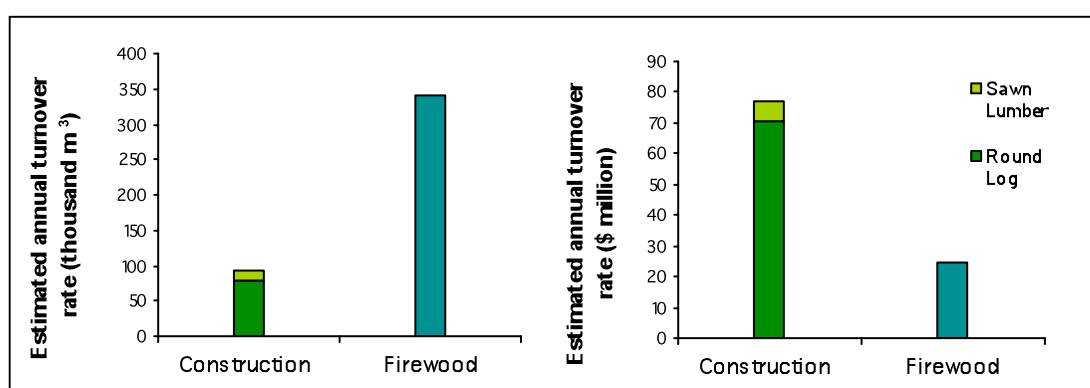
⁷ Assuming an average family consists of 6 members, consumes an average of 10kg per day for 5 months per year, calculated for 4 million inhabitants in Kabul.

of natural forest loss as it is a cultivated renewable resource. It may be that there are other reasons for concern related to agricultural practices, but these questions are outside the scope of this survey.

Comparison of Trade Volumes to Values

When comparing sales volumes to values for construction and firewood, an interesting picture develops wherein the highest volume product actually represents the smallest share of the annual earnings. Figure 6 graphically represents the inverse relationship between volume and value of construction and firewood. The left hand graph shows the proportionate share of sales volume and the right hand graph depicts sales values. Even though firewood represents over 78% of total sales volume, it earns little more than 24% of the trade value. Conversely, where construction wood constitutes only 22% of trade volumes, it nets more than 75% of the estimated earnings.

Figure 6: Comparison of estimated annual sales volumes and values for construction and fuel wood in Kabul wood markets.



Note: Figures only show results for the actual surveyed 58% of Kabul wood markets.

This result is probably a function of several factors. First and most obviously, construction wood must fulfill more stringent conditions than firewood, naturally commanding a higher price. Second, the current reconstruction activity throughout Afghanistan is probably best described as frenetic and supports a thriving market for round log and sawn lumber products. Construction techniques for large buildings use hundreds to thousands of log poles as primary support and scaffold during construction. These two factors together create a substantial demand that has had probably some impact on values – although there is no record available for comparison.

The converse relationship between volumes and values may also reflect a perverse market relationship between price and scarcity. Overharvesting of a dwindling and uncontrolled resource (despite the recent ban on logging), which is true for firewood comprised by oak and juniper, may result in an overabundance of the product on the market and thus a lower than expected value. Underdevelopment, poverty, and lack of alternative income generation in the eastern provinces certainly aggravate the situation.



Poplar poles as used in a standard construction project in Kabul. Winter 2007. Photo: WCS, J. Wingard.

SPECIES VOLUMES AND VALUES

In this section, we take a closer look at volumes and values for individual species found on the market and the relationships between them. This next level of inquiry refines our understanding of which species and areas are most affected by trade; i.e., which species of oak and juniper are the primary supply of firewood and construction wood. However, it also reveals the limits of our current knowledge of the timber trade market and raises more questions. For example, while we may know that a given species is oak and that the most likely source is within a certain band of forest types in the eastern provinces, we cannot make absolute statements about the exact areas or even the exact species as we have not been able to independently verify some of the information gained. In sum, we are largely dependent on the responses from timber traders, which serves a purpose in an initial assessment, but certainly falls short of providing the kind of detailed knowledge necessary for truly understanding both the dimensions and impacts of trade.

Species Volumes

As already stated above, the species found most in Kabul wood markets are composed of the genera *Quercus* (44.8% of annual sales volume), *Juniperus* (33.8%), and *Populus* (17.4%, Table 2). Oak and juniper are drawn almost entirely from the eastern forest regions and the volume found and traded in Kabul gives serious reason for concern. These slow growing species are mainly used as firewood and serve not only Kabul with fuel. A lack of alternative energy supply forces residents in the entire country to depend on wood to heat in winter and cook throughout the year. Poplar in contrast is mainly used for construction and probably only as a matter of reuse for fuel. It is primarily cultivated in irrigated agro-forest farms and thus its trade gives only little reason for concern in terms of natural forest cover loss.

Table 2: Timber product volumes by genus in Kabul wood markets

Genus	Observed Stock Volume (m ³)	Percentage of Stock Total	Reported Monthly Turnover Rate (m ³)	Percentage of Monthly/ Annual Turnover Rate	Estimated Annual Turnover Rate (m ³)
1 <i>Cedrus</i>	252.3	0.5%	83.2	0.2%	998.1
2 <i>Quercus</i>	18,293.4	35.4%	16,163.6	44.8%	193,802.1
3 <i>Juniperus</i>	15,907.9	30.8%	12,201.5	33.8%	146,417.7
4 <i>Populus</i>	13,808.5	26.7%	6,284.6	17.4%	75,409.9
5 <i>Larix</i>	1,594.0	3.1%	981.3	2.7%	11,775.5
6 <i>Salix</i>	60.4	0.1%	25.3	0.1%	304.2
7 <i>Abies</i>	100.1	0.2%	48.0	0.1%	576.4
8 <i>Pinus</i>	377.6	0.7%	107.4	0.3%	1,288.8
9 <i>Picea</i>	12.0	<0.0%	2.7	<0.0%	32.9
10 Pakistan poplar	1,221.5	2.4%	164.0	0.5%	1,960.3
Total	51,627.7	100%	36,061.6	100%	432,565.9

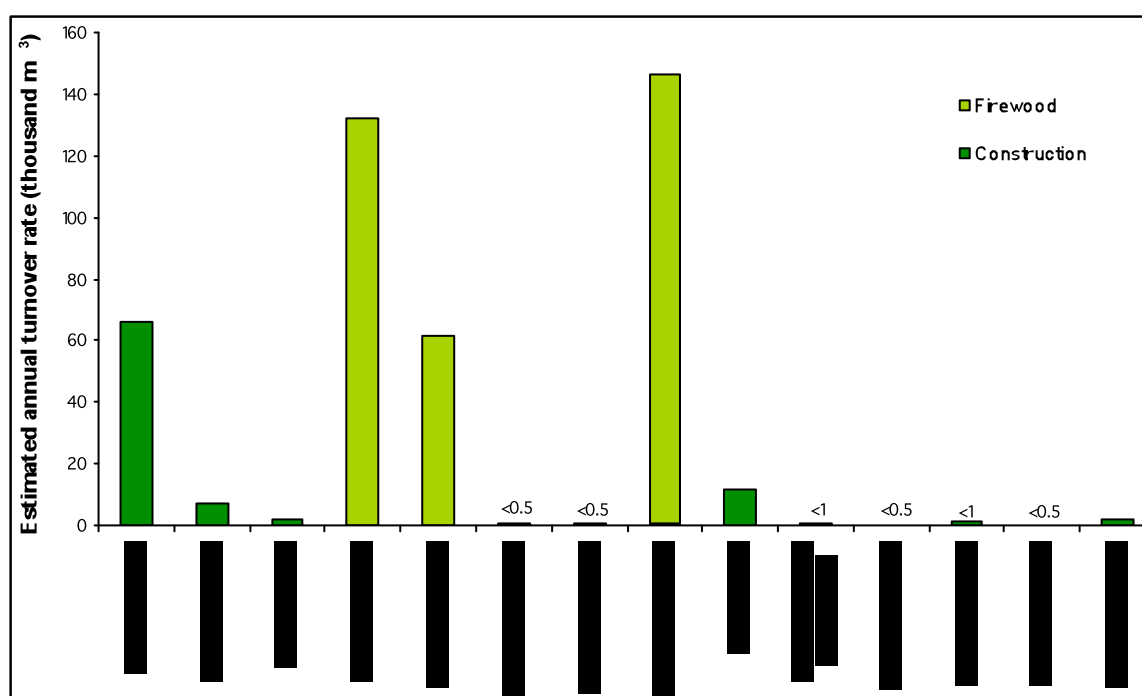
Note: Figures only show results for the actual surveyed 58% of Kabul wood markets.

Considering species levels, the highest share of annual sales rates is taken with more than one third by *Juniperus excelsa* (33.8%), with estimated average sales volumes of 252.4 thousand m³ for the entire Kabul market (146.4 thousand m³ for the actual surveyed 58% of the market; Figure 7). Juniper is followed only closely by *Quercus baloot*, which accounts for 30.6% of the overall annual sales volumes, figuring at a 228 thousand m³ turnover rate (132.2 thousand m³ for the surveyed 58% of the market). The third largest volume traded in Kabul is *Populus nigra*, making up 15.3% (114.1 thousand m³ for the overall market and 66.2 thousand m³ for the surveyed 58%). Together with the second oak species found in our survey, *Qercus dilatata*, with a similar share of 14.2% of the annual sales volume (106.1 thousand m³ for the overall market and 61.6 thousand m³ for the surveyed 58%), these four species comprise 94% of all wood traded in Kabul.

Deodar cedar is only marginally represented in Kabul markets. Accounting for only little more than 0.2% of the annual sales volume (1.7 thousand m³ for the entire market and 998 m³ for the actual surveyed 58%), the lion's share of Afghanistan's cedar trade obviously doesn't

appear in Kabul. However, as only a few lots sold substantial volumes, which possibly indicates that there are specialized traders, it might well be that our survey missed an important part of the overall cedar trade due to its uneven distribution in the Kabul markets. Drawn entirely from the eastern provinces, especially Kunar, interviews with US military based in the region let assume a highly organized cross border smuggling to Pakistan, where the trade is connected to international markets such as in the UAE and elsewhere. Our own survey staff have observed trucks loaded with Deodar cedar coming from Kunar province to Kabul, heading for sale at timber markets in Dubai.

Figure 7: Estimated annual sales volumes per species in Kabul wood markets, indicating its use for construction or fuel



Note: Figures only show results for the actual surveyed 58% of Kabul wood markets.

Species Values

Without question, cedar is the highest priced species found in Kabul markets.⁸ It has a mean value of \$546 per m³ wood (Table 3). High quality cedar even reaches an average value of more than \$671 per m³. Cedar trees are typically cut into beams measuring 15cm deep by 30cm wide by 2.5m long (0.11m³ per beam). Average price per beam is \$530 based on our survey, with at least one trader asking for a price of \$2,000 per beam. In comparison, in the year 2002, UNEP recorded prices of \$3–5 per beam obtained by local communities. The same beam then reached prices of \$50 in Afghan markets such as Kabul and up to \$85 in Pakistan. Thus prices for cedar have risen dramatically, gaining more than the tenfold in only 5 years. Reasons for this increase may be found in the recent ban on logging, the reduced overall abundance of cedar and/or an increased international demand for high value products.

After cedar, the next highest priced species are – *Picea smithiana* (\$481/m³), *Abies webbiana* var. *pindrow* (\$444/m³), *Juniperus excelsa* – when sold as construction wood (\$405/m³), *Pinus wallichiana* (\$358/m³), *Larix sibirica* (\$260/m³), *Populus ciliata* (\$237/m³), *Populus nigra* (\$216/m³), *Salix wallichiana* (\$158/m³), *Pinus gerardiana* (\$151/m³), *Populus alba* (\$143/m³), and *Quercus baloot* – when sold as construction wood (\$140/m³). Prices for

⁸ Although mainly used for carpentry, furniture, veneer, and wood carvings, cedar is here counted among the construction wood species in contrast to firewood species. It is clear that cedar is not used for constructing buildings because of its high value.

oak and juniper listed here refer to their use for construction wood, however, both are mainly sold as firewood and in these cases gain considerably lower prices: *Quercus baloot* is worth only 64% of its construction wood value and juniper only 13% (*Q. baloot* – \$90/m³; *Juniperus excelsa* – \$51/m³).

However, some caution must be exercised when considering pricing as it varied enormously not only between species but also within species, depending on size and quality of the wood (Table 3). For most construction wood species, we were unable to link the recorded quality of the wood or its dimensions to consistent price ranges and only for firewood confidence intervals for prices/m³ are within an acceptable range.

Although mean prices/m³ for 'high', 'medium', and 'low' quality firewood differ marginally (Table 3), we recorded a notable difference in turnover volumes of different quality categories for oak and juniper. Whereas oak was mostly comprised of high and medium quality wood (*Quercus dilatata* – high: 55.8%, medium: 38.6%, low: 5.5%; *Q. baloot* – high: 42%, medium: 56.5%, low: 1.5%), juniper is primarily sold as low quality wood (*Juniperus excelsa* – high: 1.2%, medium: 9.4%, low: 89.4%). Juniper seems to be widely associated with low quality timber, which in addition is also reflected by its low market value.

Table 3: Mean price/m³ for construction and firewood in Kabul by species and quality of wood.

Species		Construction				Firewood			
		Mean price per m ³ (USD)	Price per m ³ depending on wood quality (USD)			Mean price per m ³ (USD)	Price per m ³ depending on wood quality (USD)		
			High	Medium	Low		High	Medium	Low
1	<i>Cedrus deodara</i>	546.3	671.4	478.0	360.8	--	--	--	--
2	<i>Quercus dilatata</i>	--	--	--	--	89.5	92.4	86.8	88.0
3	<i>Quercus baloot</i>	139.6 ⁹	--	--	--	89.6	94.4	86.0	80.0
4	<i>Juniperus excelsa</i>	405.4	441.7	377.2	--	50.5	51.5	50.7	50.5
5	<i>Populus nigra</i>	215.5	185.5	214.0	242.0	41.0 ¹⁰	--	--	--
6	<i>Populus ciliata</i>	236.7	198.1	215.1	275.9	--	--	--	--
7	<i>Populus alba</i>	142.8	134.6	202.4	136.2	48.2 ⁹	--	--	--
8	<i>Larix sibirica</i>	260.0	285.6	217.2	192.4	--	--	--	--
9	<i>Salix wallichiana</i>	158.4	196.9 ¹⁰	--	182.2	35.4 ⁹	--	--	--
10	<i>Abies webbiana</i> var. <i>pindrow</i>	444.4	414.9	447.4	510.7	--	--	--	--
11	<i>Pinus gerardiana</i>	150.7	104.2 ¹⁰	161.2	155.2 ¹⁰	41.8 ⁹	--	--	--
12	<i>Pinus wallichiana</i>	358.0	397.2	344.5	218.2	--	--	--	--
13	<i>Picea smithiana</i>	480.5	--	--	--	--	--	--	--
14	Pakistan Poplar	178.0	179.0	175.5	192.1	--	--	--	--

Note: Grey color indicates non consistency of expected price classes (mean price/m³) with reported quality categories.

Considering overall sales values in Kabul markets, the picture shifts from cedar to poplar. Although cedar is the highest priced species (\$546/m³), due to its small volume traded in Kabul (0.2%), it makes up just 1.2% of annual sales values (Table 4). Poplar in contrast, found only in the midrange of price/m³ (\$198/m³), takes with 58.4% the major share of annual sales values (\$102 million for the entire market and \$59.2 million for the actual surveyed). As it accounts for more than 81% of the overall sales volume of all construction wood traded in Kabul, this result is not surprising. Leading in terms of annual sales values, poplar is followed by oak (16.9%), juniper (7.8%), pine (5.3%), larch (4.3%), cedar (1.2%), fir (1.1%), and willow (0.1%). Spruce is only sold at two woodlots, making its contribution to annual sales values negligibly (<0.0%).

⁹ Only one incidence.

¹⁰ Only two incidents.

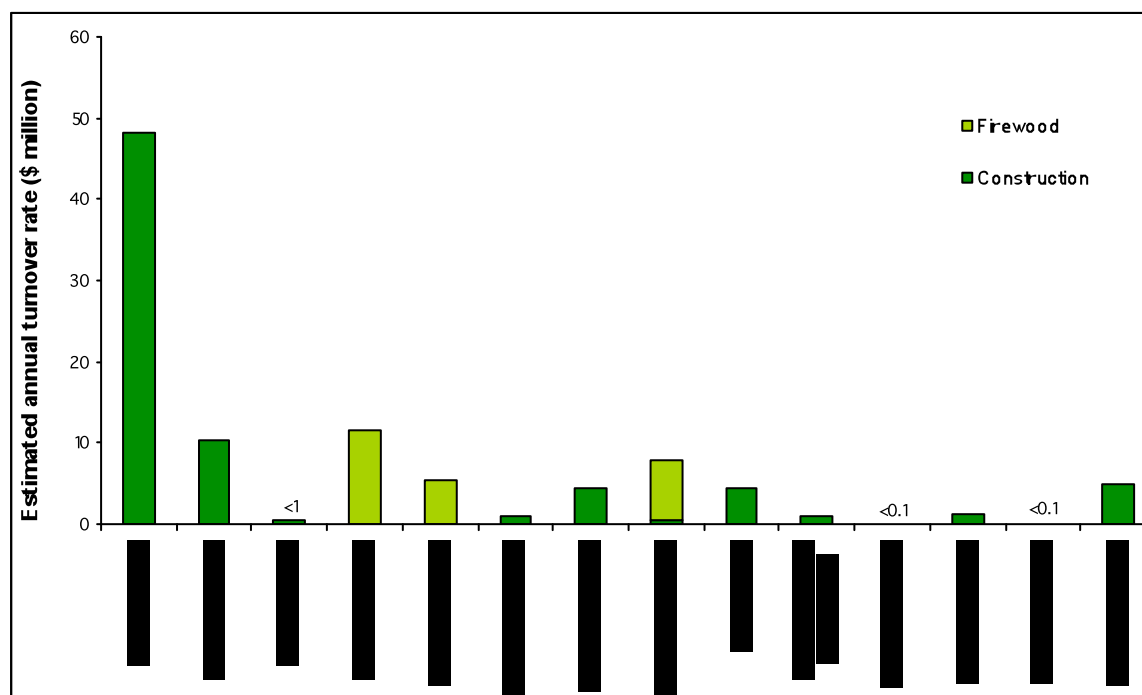
Table 4: Timber product values by genus in Kabul wood markets

Genus	Observed Stock Value (USD)	Percentage of Stock Total	Reported Monthly Turnover Rate (USD)	Percentage of Monthly/ Annual Turnover Rate	Estimated Annual Turnover Rate (USD)
1 <i>Cedrus</i>	244,200.0	1.6%	104,870.0	1.2%	1,258,440.0
2 <i>Quercus</i>	1,637,043.8	10.7%	1,428,807.2	16.9%	17,132,823.0
3 <i>Juniperus</i>	883,145.6	5.8%	662,646.7	7.8%	7,951,759.9
4 <i>Populus</i>	11,447,068.9	75.0%	4,933,498.9	58.4%	59,205,586.6
5 <i>Larix</i>	636,314.2	4.2%	366,368.8	4.3%	4,375,065.6
6 <i>Salix</i>	7,496.0	<0.0%	5,924.0	0.1%	71,088.0
7 <i>Abies</i>	25,632.0	0.2%	89,180.0	1.1%	1,070,160.0
8 <i>Pinus</i>	84,543.2	0.6%	451,407.4	5.3%	5,416,888.8
9 <i>Picea</i>	2,730.0	<0.0%	1,460.0	<0.0%	17,520.0
10 Pakistan poplar	291,960.0	1.9%	407,014.0	4.8%	4,884,168.0
Total	15,260,133.7	100%	8,451,177.0	100%	101,383,499.9

Note: Figures only show market results for the actual surveyed 58% of Kabul wood markets.

We found three different poplar species in Kabul (*Populus nigra*, *ciliata*, *alba*), of which the most important in terms of sales values is *Populus nigra* (Figure 8). This species alone accounts for almost half (47.6%) of the annual sales values; estimated at \$83.2 million for the entire Kabul wood markets (\$48.3 million for the actually surveyed 58%). The second most profitable species is *Quercus baloot*, taking a share of 11.5% of the annual turnover rate and \$20 million for the overall market (\$11.6 million for the surveyed 58%). This is closely followed by the second poplar species *Populus ciliata* (10.3%; \$18 million for the entire market and \$10.4 million for the surveyed 58%). Other important species include in order of their annual sales values *Juniperus excelsa* (7.8%) and *Quercus dilatata* (5.4%).

Figure 8: Estimated annual sales values per species in Kabul wood markets, indicating its use for construction or fuel



Note: Figures only show results for the actual surveyed 58% of Kabul wood markets.

Comparison of Species Volumes to Values

Poplar is the most important timber product economically. Although it only represents 17.4% of the annual sales volume, it accounts for more than half (58.4%) of the annual sales value. In comparison, oak and juniper, composing the lion's share of wood traded in Kabul's markets (78.7%), provide an annual sales value of only 24.8%. The use of poplar, oak, and juniper reflects the results gained when considering sales volumes and values of construction versus firewood. Poplar is primarily used for construction and gains are far

higher than for oak and juniper, which are almost exclusively used as firewood (Figure 7 and Figure 8; Table 13 - Table 16, see Appendix pp. 61 - 62).

Poplar species are mainly grown in small agro-forest plantations. Cultivated by local people their harvest does not impact natural forest stands such as the eastern forests. The situation, however, is different for oak and juniper. Both species are almost entirely drawn from the eastern forest regions, their only source of origin and possible growth range in Afghanistan. The trade volumes found in the Kabul markets can almost directly be translated into clearing of the eastern forests. These slow growing species are sold for a tremendously low price compared to other species.

REGIONAL SOURCES OF TIMBER TRADE

With a population of more than 4 million people, Kabul is one of the central timber markets in the country, drawing upon forest resources from at least 16 provinces (including the eastern forests) and three other countries (Russia, Pakistan and Uzbekistan). However, only two eastern provinces figure prominently in our estimates for Kabul timber trade volumes: almost half of the annual sales volume is drawn from Paktiya (47.4%) and another third comes from Khost (29.1%). Other important sources, inside and outside the country in order of their annual turnover share are Ghazni (8.4%), Bamyan (3.8%), Russia (2.7%), Wardak (2.6%), Pakistan (1.8%), Paktika (1.7%), and Logar (1.2%). Remaining supplier-provinces, providing less than 1% of the overall annual sales volume, include Parwan, Kunar, Kabul, Balkh, Uruzgan, Daikondy, Kunduz, Baghlan, and Sari Pul (Table 32, see Appendix p. 67).

Contrary to expectations, timber originating from Kunar and Nuristan, two of the most forest rich provinces in the eastern region and overall Afghanistan, is only marginally represented in the Kabul market survey. Timber drawn from Kunar accounts for only 0.2% of the annual sales volume and Nuristan does not occur at all as a producing province. Other eastern forest provinces, such as Paktika (1.7%) and Logar (1.2) only show relatively small market shares. However, these provinces have a well-documented and thriving timber based economy and the almost complete absence of wood occurring from these specific regions is reason for concern because of their vicinity to the Pakistan border. Interviews with US military personnel operating in Kunar describe highly visible and continuing illegal timber trade across the Pakistan border.

The majority of Kabul's timber supply is focused on just two provinces in the east. As mentioned above, Paktiya and Khost provinces supply more than three quarters (77%) of Kabul's entire timber product needs, producing almost exclusively oak and juniper: 99.3% of the annual sales volume deriving from Paktiya is comprised by these two genera (*Quercus dilatata* – 13.2%, *Q. baloot* – 42%, *Juniperus excelsa* – 44.1%; Figure 9), and 99.7% respectively, originating from Khost (*Quercus dilatata* – 26.9%, *Q. baloot* – 31.7%, *Juniperus excelsa* – 41.1%). But these two provinces not only provide almost entirely oak and juniper species, they are also the producing provinces for almost all of oak and juniper traded in Kabul. *Quercus dilatata* is drawn to 99.4% from Paktiya and Khost (Khost - 54.9%; Paktiya – 44.4%), *Q. baloot* to 96% (Paktiya – 65.8%; Khost – 30.2%), and juniper to 97.7% (Paktyia – 62.4%; Khost – 35.3%). Though way behind in terms of trade volumes, the third most important source for oak and juniper is Paktika (*Quercus baloot* – 3.7%, *Q. dilatata* – 0.3%, *Juniperus excelsa* – 1.4%).

As oak and juniper are primarily used as firewood, Kabul's entire fuelwood supply is covered by resources drawn from Paktiya and Khost in the eastern forest region. This lopsided supply translates into severe pressure on a limited area that certainly can't sustain this anymore over a very long time. Missing information about the actual forest cover left, a lack of control on the resource supply, and corruption among enforcement personnel aggravates the situation, making these provinces a primary focus area for starting counteracting work.

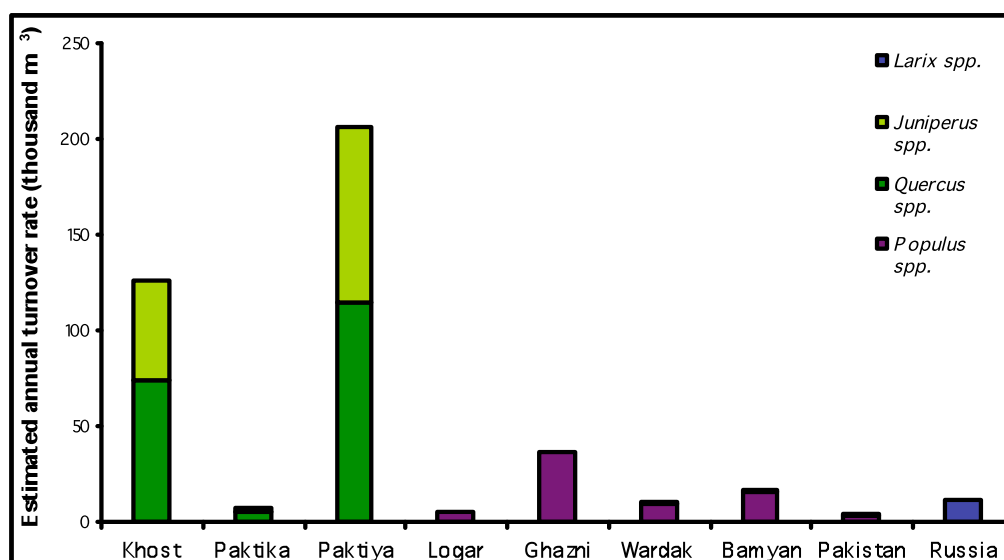
Other species drawn from Paktiya and Khost include pine species, although both, *Pinus gerardiana* (Paktiya – 40.3% of annual sales volume; Khost – 14.8%) and *P. wallichiana* (Khost – 14.7%; Paktiya – 13%) are imported primarily from Pakistan (*Pinus gerardiana* –

44.9% and *P. wallichiana* - 68.1%), *Abies webbiana* var. *pindrow* (Paktiya – 78.1%; Khost – 7.7%; Pakistan – 14.2%), *Cedrus deodara* (Paktiya – 36.1%; Khost – 1.5%; Kunar – 49.5%; Pakistan – 2.9%), and *Picea smithiana* (Khost – 98.2; Paktiya – 1.8%).

With the exception of the eastern forest provinces, Paktiya, Khost, and Paktika, the majority of the regional sources supply the Kabul market with construction wood primarily in the form of poplar round logs. The most important provinces for poplar are Ghazni (48% of annual sales volume), Bamyan (21.5%), Wardak (14.5%), and Logar (7%; Figure 9). Another 5.5% is drawn from Pakistan (not included here the so called Pakistan poplar). Together these provinces produce 96.4% of all poplar traded in Kabul. The remaining share of poplar is drawn from Balkh, Sari Pul, Kunduz, Uruzgan, Daikondy, Baghlan, and Parwan. *Salix wallichiana* in part stems from the same provinces as poplar, originating primarily from Ghazni province (63.2%), Logar (18%), Wardak (12.4%), Kabul (5.2%), and Bamyan (1.1%).

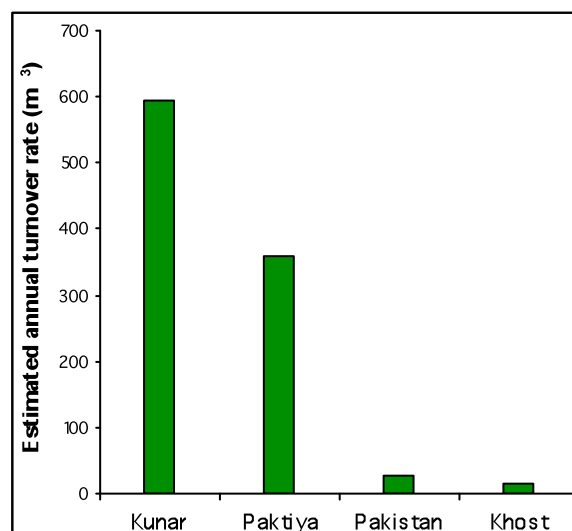
The small amount of timber deriving from remote provinces, such as Balkh, Sari Pul, Kunduz, Uruzgan, or Daikondy, is not surprising, when considering cost intensive transport needs, even in case the trade is linked to other businesses in order to reduce transport costs. Other reasons might include climate conditions of the region, low rainfall and the destruction of irrigation systems during the time of war and conflict, resulting in insufficient irrigation capacity at the time, which in turn limits overall timber production.

Figure 9: Regional sources of timber product species in Kabul wood markets



Note: Figures only show results for the actual surveyed 58% of Kabul wood markets.

Figure 10: Regional sources of cedar in Kabul markets



Note: Figures only show results for the actual surveyed 58% of Kabul wood markets.

Cedar, though only found in very low numbers (0.2% or 998.1m³ of annual sales volumes), is mostly drawn from Kunar (59.5%) and Paktiya province (36.1%). A small amount comes from Khost (1.5%) and another portion is imported from Pakistan (2.9%, Figure 10). Indirect evidence (virtual absence of stock in Kabul) and anecdotal information (descriptions of ongoing trade) suggest that trade in cedar is almost entirely captured by direct illegal cross border trade with Pakistan. Our survey team observed trucks loaded with cedar coming from Kunar in transit through Kabul. When questioned, transporters reported that they were headed

for timber markets in Dubai. However, we were not able to verify this information. Cedar trade seems to be highly organized and the same applies here as said earlier for the eastern forest region: lack of information about cedar abundance and lack of sustainably managed and controlled harvest mixed with corruption and missing enforcement are the primary threats to the most valuable timber species of Afghanistan.

Timber coming from Pakistan may in fact be originating from other areas in Afghanistan, crossing the border into Pakistan, and then being declared as an import upon reentry. As explained by timber traders, wood harvested in northeastern Afghanistan can be more efficiently be transported to Kabul along eastern trade routes through Pakistan, and then reentered somewhere along the border closer to Kabul. The recent logging ban adds an additional incentive to this venture, as the 'import' status is effective in claiming that the wood was legally harvested.

However, of all wood traded in Kabul timber drawn from Pakistan accounts for only 1.8% of the annual sales volume. Almost two thirds (62.5%; Table 5) are comprised by poplar species, which refers for 96.4% of the so called Pakistan poplar and another 5.5% of other poplar species (*Populus nigra* – 4.6% of annual sales volume; *P. ciliata* – 8.2%, *P. alba* – 22.9%). The second most important product drawn from the neighbouring country is pine. Making up only 9.7% of all timber imported, *Pinus wallichiana* is derived to 14.7% from Pakistan and *P. gerardiana* to even 44.9%. Other imported species include *Abies webbiana* var. *pindrow* (14.2% of annual sales volume), *Cedrus deodara* (2.9%), *Quercus baloot* (0.3%), and *Juniperus excelsa* (0.4%).

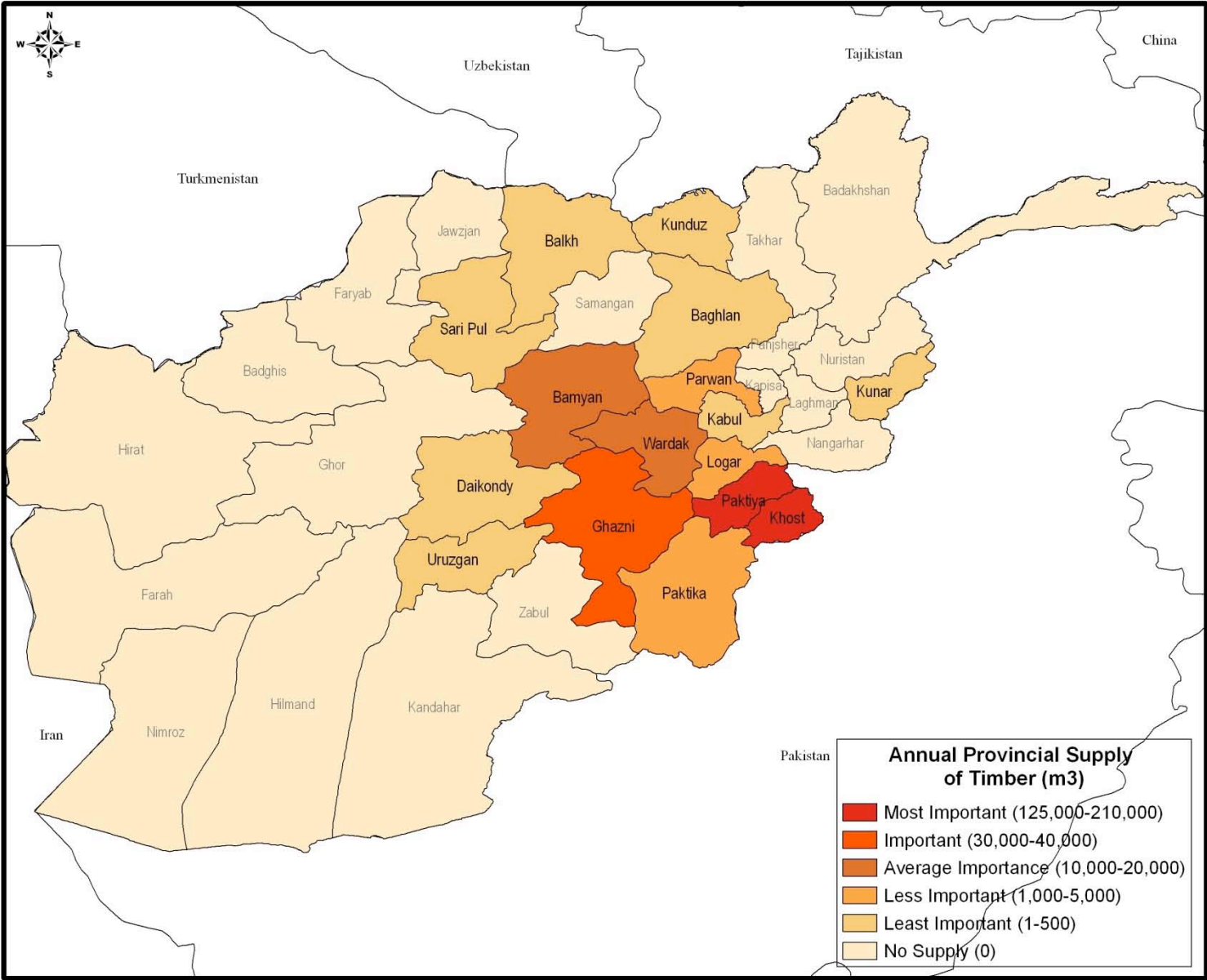
Table 5: Timber trade species coming from Pakistan into Kabul wood markets

Genus	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/ annual turnover rate	Estimated annual turnover rate (m ³)
1 <i>Cedrus deodara</i>	51.1	2.0%	2.4	0.4%	28.6
2 <i>Quercus dilatata</i>	0.0	0.0%	0.0	0.0%	0.0
3 <i>Quercus baloot</i>	35.1	1.4%	34.3	5.2%	412.2
4 <i>Juniperus excelsa</i>	88.4	3.5%	51.6	7.8%	619.7
5 <i>Populus nigra</i>	731.2	28.9%	255.2	38.6%	3,062.3
6 <i>Populus ciliata</i>	151.2	6.0%	48.5	7.3%	582.2
7 <i>Populus alba</i>	56.0	2.2%	40.0	6.1%	480.0
8 <i>Larix sibirica</i>	0.0	0.0%	0.0	0.0%	0.0
9 <i>Salix wallichiana</i>	0.0	0.0%	0.0	0.0%	0.0
10 <i>Abies webbiana</i> var. <i>pindrow</i>	43.8	1.7%	6.8	1.0%	82.1
11 <i>Pinus gerardiana</i>	93.0	3.7%	17.8	2.7%	213.6
12 <i>Pinus wallichiana</i>	129.3	5.1%	46.1	7.0%	553.5
13 <i>Picea smithiana</i>	0.0	0.0%	0.0	0.0%	0.0
14 Pakistan Poplar	1,148.6	45.4%	158.0	23.9%	1,896.6
Total	2,527.6	100.0%	660.9	100.0%	7,930.7

Note: Figures only show results for the actual surveyed 58% of Kabul wood markets.

Almost all of larch (99.2%) is reportedly imported from Russia. Surveyors were unable to verify the actual source of this larch species, however, there are reasons to believe that the costs of transport from as far away as Russia would make it impractical and another source location is likely involved. For more details on producing provinces for single timber species please also see Table 17 - Table 32, see Appendix 63 - 67.

Figure 11: Ranking provinces in order of importance to timber trade in Kabul



PRIORITY IMPLICATIONS

This survey estimates that timber trade in the Kabul market alone equals to more than 2% of the country's gross domestic product; a figure that does not reflect the value of cedar trade, illegal cross border trade with Pakistan from at least three timber rich provinces (Nangarhar, Kunar and Nuristan), or timber trade in other parts of the country. This is an even more surprising finding considering the little forest cover left (2%) in Afghanistan and the therefore only small margin for a robust timber related economy. More analysis, however, will need to happen before a final understanding of the potential impacts of this trade on the remaining forests will be fully understood.

This section highlights three areas we believe need priority attention: the interlinkage of conflicts in the eastern forests with concerns over ownership and use of natural resources, the control of trade in cedar and increase in in-country earning potential through value-added processing, and a reduction on firewood dependence through alternative energy sources and fuel efficiency techniques. As iterated already in several reports on the subject, it is clearly understood, that what we have highlighted here need to go hand in hand with efforts to improve overall forest conservation including but not limited to rehabilitation measures, securing local rights to access and use resources, and improving management capacities at the national, regional and local level.

CONFLICTS, COMMUNITIES, AND NATURAL RESOURCES

Eastern Afghanistan, located along the border with Pakistan and comprising the provinces of Nuristan, Kunar, Nangarhar, Paktiya, Khost, and Paktika, is one of the richest areas in natural resources in the country. Local communities rely heavily on the forest and its products, providing goods such as timber, food, fodder in dry seasons, and employment. Local people are the first affected by forest loss. Simultaneously, the eastern forest region is one of the most unstable places in Afghanistan. By early 2007, the number of security incidents occurring in the east exceeded those happening in provinces like Kandahar or Helmand – two provinces that receive regular attention at least in international news covering clashes between Taliban and coalition forces.

Unlike the south, however, conflicts in the provinces of the east are of a different nature and bear consideration not only in light of the information provided in this report, but in efforts to design or implement forest related projects in the region. In southern Afghanistan, relatively few families wield enormous wealth and power over the rest. Because of this, clashes between families and tribes are less pronounced. The war being waged in the south is largely a fight between the Taliban and the coalition forces. In the eastern provinces, conflicts with Taliban also occur, however a number of conflicts concern ownership and use of natural resources, in particular forests and land. Many of these conflicts have been ongoing for decades – some have persisted for over 100 years. New conflicts are still emerging, many of them turning violent and resulting in riots and/or fatalities.

Over the last decade, uncontrolled deforestation has taken place in the formerly densely forested region, which has caused a series of environmental problems, soil erosion being just one of many. The growing resource scarcity has heightened the potential for conflict, which in turn can easily be exploited by the Taliban (or those criminal elements that pass for Taliban) causing additional destabilization of the region.

Thus an important step towards stabilizing eastern Afghanistan is the establishment of an efficient natural resource use management system, including reforestation programs. A sustainable use of forest products will in the long-term provide secure income opportunities for communities, either directly through employment in timber trade businesses or indirectly through collecting and selling NTFPs.

CEDAR TRADE

Domestic and international trade in cedar products from Afghanistan stretches back at least 50 years (FAO 2006). Highly specialized and organized trade chains exist, exporting wood across the Pakistan border and from there to markets in Dubai, with distribution potentially worldwide. However, the long years of conflict have effectively prevented the Afghan government from exercising any real control over harvest levels or trade routes. By all reports, cutting pace even increased since the recent ban on logging (Baldauf 2002) and trade is controlled by tribal leaders and commanders with little concern for sustainable harvest rates or the potential for greater earnings through local value-added processing.

In the Kabul market, cedar is seen only to a limited extent, but is by far the most valuable wood sold. Based on our results, cedar experienced a tenfold increase of its market value in only 5 years. In the year 2002, UNEP recorded prices of \$3–5 per beam (measuring 15cm deep by 30cm wide by 2.5m long) obtained by local communities. The same beam then reached prices of \$50 in Afghan markets such as Kabul and up to \$85 in Pakistan. In comparison, our survey documented average prices per beam of an average \$530 per beam. At least one trader claimed an asking price of \$2000 per beam. Reasons for this increase may be an effect of the recent ban on logging, the reduced overall abundance of cedar and/or an increased international demand for high value products.

Cedar has a number of potential uses (oil extraction, veneer, wood carvings, furniture) and still, Afghanistan is realizing only a small fraction of the potential value possibly gained with cedar production. Almost the entire harvest leaves the country as unprocessed balks. Value added processing such as furniture making and/or wood carvings is mainly done outside of Afghanistan and thus the country - despite its long standing history in wood carvings - leaves a great potential for economic development untouched.

Its high market value combined with its high growth rate makes cedar an ideal resource for sustainably managed use. Already well-established international trade chains and markets provide good preconditions to start small scale businesses in the eastern provinces which could profitably engage in cedar processing such as wood carvings. A controlled harvest and management regime based on strengthened community involvement needs to be developed in order to allow sustainable use, and processing and marketing of cedar wood.

However, there are no simple solutions to the problem and this report does not pretend to detail new ideas on the subject. Well known is that to control cedar trade and reverse the trend will require a concerted effort involving several components including policy development and implementation, community-based management approaches, reforestation and possibly afforestation efforts, and increased enforcement. This last one is of course the most problematic – as noted in the previous section discussing local conflicts in the eastern forest region.

FIREWOOD, ALTERNATIVE FUELS AND ENERGY EFFICIENCY

While cedar is important due to its high value and potential for the timber market, two other species, oak and juniper, need an equal level of attention because of their importance as fuel source. The combined sales volume of oak and juniper exceeds all other species found in Kabul markets. The primary source for juniper and the exclusive source for oak is the eastern forest region. Despite long standing efforts to stop logging and engage in sustainable management practices, the impact on forest resources is high and the situation remains critical. The demand for firewood in Afghanistan has led to serious deforestation (ADB 2006) and ways to reduce resource dependence and increase use efficiency are of prime importance for preventing ongoing forest cover loss in the eastern regions.

Although Afghanistan is well endowed with natural gas, coal, and hydropower, more than 85 percent of Afghanistan's energy needs are met by fuelwood (ADB 2006). Known gas reserves total about 120 billion m³ with a possible additional 1,000 billion m³ at deeper levels. However, cost-effectiveness of gas and other fuels relative to wood is very low. In Kabul we

estimate a cost of \$174 per family and winter (5 months) to heat the home using fuelwood, versus US\$810 using gas. Winters in Afghanistan, especially in the northern regions, are cold, going well below freezing for several months a year. With fewer than 6% of the population having access to electricity or other commercial energy sources, fuelwood is a primary source of energy for both cooking and heating (ESMAP 2006). Based on our survey results, we calculated⁷ that fuelwood supplies only approximately 40% of the space heating requirements of the residential sector in Kabul.

Although firewood comprise more than two thirds of all timber traded in the city (78.9%), it accounts for only 24.3% of the turnover value. When averaged, both species, oak and juniper, are sold for approximately 20% of construction wood values (firewood – \$70.1/m³; construction wood – 333.8/m³). Considering the low value gained by firewood, taxation might be an option to possibly exploit the economic margin and provide a revenue stream for management.

However, the economic margin, e.g. evidenced by average household salaries that can be exploited at all needs to be assessed before applying taxes. If people cannot afford to pay a higher price for firewood, then the system runs the risk of either being ignored or creating more illegal trade. Considering the current situation in Afghanistan and the dependence on cheap fuel sources for heating in winter and cooking throughout the year, it seems unlikely that without further overall economic development of the country people can afford higher fuel prices. Indeed, the extensive consumption of firewood is probably the very result of a lack of financial means and product of insufficient affordable alternative energy supplies such as gas and electricity. Already now, lack of access to fuel wood forces the city population to resort to burning packaging materials, including plastic that cause the release of toxic fumes. During late autumn and winter, air quality in Kabul is worsened by the increase of domestic emissions arising from ineffective residential heating technologies. In addition, taxes will only work well as long as there is an accounting and legal system in place that allows for the earmarking of gained funds and an equitable sharing of revenues that flow back to a sustainable forest management system. These preconditions are not yet present in Afghanistan.

While urban areas are more likely to have access to gas supplies, investments in alternative energy resources and energy efficiency are crucial in rural areas. Solar systems and/or small wind turbines could provide a substantial alternative to gas in the long term. Insulation of houses and improvements of oven heating systems, as shown elsewhere (Tajikistan, DED/GTZ CCD 2007) are an efficient way to decrease the amount of fuel needed in the winter. Several projects are already ongoing in different regions in Afghanistan (Achtari 2006) and prove initial success. However, a successful implementation of comparable projects in the eastern forests region depend on a security situation that allow for a long term approach.

REFERENCES

- Abdul Latif and Zabta Khan Shinwari (2001). Sustainable Forest Development for Non-Timber Forest Products in Pakistan. Kohat University of Science & Technology, Kohat Pakistan
- Achtari M.S. (2006). Example of village development in Afghanistan based on renewable energy
- AgroForestry Tree Database. (2008). A tree species reference and selection guide, <http://www.worldagroforestrycentre.org>. World Agroforestry Centre
- Ammini Ramachandran (undated). Asafoetida. <http://www.sallys-place.com/food/columns/ramachandran/asafoetida.htm>
- Anonymous, (2002). Afghanistan – Country Profile 2002. The Economic Intelligence Unit
- Anonymous, (2002). Afghanistan – Country Report – May 2003
- Asian Development Bank (2006). Master Plan to Realize Potential of Afghanistan's Energy Sector
- Auden, J. B. (1973). Forest Expansion, Rural Forestry and Commercial Forest Yield in Eastern Afghanistan - German - Fischer, D. Geographical Journal 139: 339-340
- Ayazi, A.R. (2002). Special Programme for Food Security – Exploratory Formulation mission – Assignment report
- Azimi, A. and D. McCauley, (2002). Afghanistan's Environment in Transition. Asian Development Bank. Kabul Afghanistan
- Baldauf Scott (2002). Log experts sap Afghan rebuilding. The Christian Science Monitor
- Benge, M. D. (2003). Reforestation in Afghanistan. United States Agency for International Development. March 2003
- Brand, M. H. (1997-2001). University of Connecticut Plant Database, <http://www.hort.uconn.edu>
- Breckle, S. W. Flora and vegetation of Afghanistan, pp. 1-8, http://www.ag-afghanistan.de/files/breckle_flora.pdf
- Byrd, W., (2002). Afghanistan's reconstruction regional and country context – a discussion paper
- Chandrasekharan, C. (1981). Forest and Forestry in Afghanistan
- Contreras, A. (2002). Policy and legal options to improve law compliance in the forest sector – Draft issues paper. January 2002
- Centre for Science and Environment (2001). Global demand makes gum collection viable livelihood source
- Davis, D.C. (2002). Participatory natural resource management and poverty alleviation in the watersheds of the northern Spin Gar mountains of Nangarhar province. Project brief. Oct. 2002
- Daud Saba (2001). Afghanistan's Natural Heritage, Problems and Perspectives. *Lemar-Aftaab* Secretariat of the Convention on Biological Diversity (2001). Sustainable management of non-timber forest resources. Sustainable management of non-timber forest resources. Montreal, SCBD, 30 p. CBD Technical Series no.6
- DED/GTZ CCD (2007). Sustainable Management of Natural Resources in Gorno-Badakhshan (Pamirs)
- Earle, C. J. (2007). *Larix sibirica* description, <http://www.conifers.org>. The Gymnosperm Database
- eFlora. (2008). Flora of Pakistan, <http://www.efloras.org/index.aspx>
- ESMAP (2006). Afghanistan: Household Energy Demand. Concept Note for Research and Capacity-Building Under Thematic Program "Energy-Poverty
- Evans, E. (2003). Trees: *Cedrus deodora*, http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/trees-new/cedrus_deodora.html. North Carolina State University
- FAO (1994). International trade in non-wood forest products: An overview
- FAO (2001). Non-Wood Forest Products in the Near East: A Regional and National Overview

- FAO (2001). Programme of Community Based Sustainable Forest Management and Fuelwood Plantations. A proposal for FAO/TCP. 25 January 2001
- Gentry, H.S., M.Mittleman, and P.R. McCrohan (1990). Introduction of chia and gum tragacanth in the U.S.. p. 252-256. In: J. Janick and J.E. Simon (eds.), *Advances in new crops*. Timber Press, Portland, OR
- Groninger, J. W. (2006). Forestry and forestry education in Afghanistan. *Journal of Forestry* 104: 426-430
- Ibrahimi, S.Y., (2005). Afghanistan Pins Its Hopes on Pistachios. Environment News Service. www.ens-newswire.com
- Iremonger, S., C. Ravilious and T. Quinton (1997). A statistical analysis of global forest conservation. In: Iremonger, S., C. Ravilious and T. Quinton (Eds.) *A global overview of forest conservation. Including: GIS files of forests and protected areas, version 2*. CD-ROM. CIFOR and WCMC, Cambridge, U.K
- International Centre for Agricultural Research in the Dry Areas (2008). *The Rich Potential of Horticulture in Afghanistan*
- Khaurin, H. H. (1996). Survey and identification of fodder trees and bushes in Afghanistan, Project of Animal Health and Livestock Production for Afghanistan. Food and Agriculture Organization of the United Nations
- Kemal-ur-Rahim, K. (2003). A review of the horticultural marketing and post-harvest conditions in Afghanistan. Kabul Afghanistan. June 2003
- Muhammad Hamayun, Sumera Afzal Khan, Habib Ahma, Dong-Hyun Shin and In-Jung Lee (2006). Morel collection and marketing: A case study from the Hindu-Kush mountain region of Swat, Pakistan
- Newman, S. (1996). Forestry and Agroforestry – in Promotion of agricultural rehabilitation and development programmes. Report of the TCP/AFG/4552
- PFAF. (2000). Plants for a future - species database. <http://www.ibiblio.org/>
- Royal Roads University (2005). Morel Mushrooms. Centre for Non-timber Resources Interactive Community
- Tandon, J.C. (1988) Forest and Forestry in Afghanistan – Sector review. AFG/86/011 September 1988
- Troger, E. (1971). Forestry Conservation in Eastern Afghanistan - German - Fischer, D. *Mitteilungen Der Österreichischen Geographischen Gesellschaft* 113: 380-381
- UNEP (2003). Post Conflict Environmental Assessment. Kabul, Afghanistan
- Von Dückelmann, R. (1951). Forestry and Forest Resources of Afghanistan. Dec. 1951
- Vaidyanathan, S. and Jathanna, D. 2007. A preliminary assessment of wildlife in the Eastern Forest Complex of Nuristan, Afghanistan. Wildlife Conservation Society Afghanistan Field Report, pages 1-50.
- Wedderburn, R.J. by Strengthening of Forestry department – AFG/86/011. Consultancy in forest nursery

APPENDICES

DESCRIPTION OF INDIVIDUAL SPECIES AND SURVEY RESULTS

The following section provides information on individual tree species found in the wood markets of Kabul. It includes descriptions of natural habitat, ecology and geographic distribution, typical uses, and the relevant results from the WCS survey.

Cedar or "Lamanza" (*Cedrus deodora*)

Family: Pinaceae

Synonyms: *Cedrus indica*, *Cedrus libani* variation *deodara*, Himalayan cedar

Sources: Breckle 2006, The Gymnosperm Database, Plants for A Future Database

Ecology: *Cedrus deodara* is an evergreen tree growing between 1,800 and 3,100 meters in drier areas of the Himalayas. It has a moderate growth rate and flowers from October-November with seeds ripening from October-December. It is monoecious (male and female flowers exist on the same plant) and wind pollinated. *C. deodara* grows to between 30 and 50m with horizontally arranged branches. Its needles, which are between 3 and 5cm in length, are blue-green and form a cluster of about 30. Blue-green cones occur in pairs or solitarily, and grow to about 7-10cm in length.

C. deodara grows in light (sandy), medium (loamy), or heavy (clay) soils but prefers deep, well-drained soils in sun or partial shade. Adult trees are relatively shade tolerant, but young trees are sometimes slow to establish as they are prone to injury from frost and cold wind. *C. deodara* is a relatively hardy species that tolerates high alkalinity in soil as well as drought and strong winds. It is a component of dense temperate forests and grows in association with an array of other conifer and broadleaf species including *Pinus wallichiana*, *Taxus baccata*, *Pinus smithiana*, *Abies spectabilis*, *Abies webbiana* var. *pindrow*, *Quercus* spp., *Acer* spp., and *Betula* spp. at higher elevations. At lower elevations it is more likely to be found among *Pinus gerardiana* and *Juniperus excelsa* subsp. *polycarpus*.

Geographic distribution: Deodars are native to the Himalayas and found typically in areas where precipitation, usually in the form of snowfall, ranges from less than 1000mm per year up to 2500mm per year. It is distributed across drier areas of the Himalayas from Afghanistan to Nepal and is found as an ornamental exotic in the western United States and Europe. In a report documenting a field site visit to Kunar and Nuristan, FAO forestry experts recently reported extensive *C. deodara* stands above 1800m asl. The same report also chronicles an active trade in cedar barks (together with pine and possibly spruce and fir) along the main road east of Kabul from Jalalabad to Bargi Matal.

Typical Use: *C. deodara* is an important timber tree in Pakistan and India and has been heavily exploited for logging in Afghanistan. The wood is hard, durable, aromatic, fine, and even-grained making it a valuable timber species. It is mainly used for boats and as veneer for furniture. *C. deodara* is a poor fuelwood but is often planted as "shelter" because it tolerates high winds.

It is as well used as a medicinal plant across much of its range. The bark is an astringent used to treat fevers, diarrhea and dysentery. Distillation of the wood produces a medicinal essential oil used to treat bronchitis, mucous discharge, and skin eruptions. The oil has also been used in some cultures as treatment for tuberculosis. The wood as well can be prepared to treat fevers, flatulence, pulmonary and urinary disorders, rheumatism, kidney stones, insomnia, diabetes and has also been used as an antidote to snake bites. A resin from the wood can be applied externally to bruises, skin diseases and joint injuries.

Survey Results: *C. deodara* was surprisingly rare in Kabul wood markets; found in only 11 woodlots of 1,719 surveyed (0.6%). The average amount in stock was only 3.5m³, (min: 1.1m³; max: 10.5m³), however we did find two woodlots with substantially larger volumes on

hand (89.3m³ and 134.0m³) which possibly indicates that there are specialized traders and it might well be that our survey missed an important part of the cedar trade due to the uneven distribution throughout the Kabul market.

Based on recorded monthly turnover rates we estimate an annual sales volume of 998 m³ (0.2%) for the surveyed 58% of Kabul wood markets (1.7 thousand m³ for 100%). Cedar is sold exclusively as construction wood ('construction' in this specific case refers to use for carpentry and constructing furniture – to our knowledge, cedar wood is not used in Afghanistan for constructing buildings), whereas 94.3% occurs as the typical balks. Only 5.7% round logs were found.

Cedar gained the highest price of all timber species in the Kabul wood markets, selling for an average of \$546/m³; for high quality wood the price even reached an average of \$671/m³ and low quality wood still sells at \$361/m³ (followed by *Picea smithiana*: \$481/m³ and *Abies webbiana* var. *pindrow*: \$444/m³). Though high priced, due to the only small volume found, cedar accounted for only 1.2% of the annual sales value (\$1.3 million for the surveyed 58% of Kabul wood markets and \$2.2 million).

Kunar (59.5% of annual sales volume; Table 18, see Appendix p. 63) and Pakiya (36.1%) provide the major share of *C. deodara* for the Kabul markets. Other sources include Pakistan (2.9%) and Khost (1.5). Reported illegal timber trade across the Pakistan border might be the reason why there was no wood found originating from Nuristan, one of the major produce provinces of cedar wood.

Oak or "Darakht-e-maró" (*Quercus dilatata*)

Family: Fagaceae

Synonyms: None

Sources: eFlora Database, FAO Database, Plants for a Future Database

Ecology: *Quercus dilatata* is an evergreen tree growing between 2,100-2,700m. Little is known about the growth rate of this particular species except that an adult tree will reach about 20m in height. It is frost tender and young trees may be slow to establish due to frost injuries. Leaves on *Q. dilatata* are elliptic-ovate to broadly lanceolate (long and wider in the middle) and dark green. Leaves are often covered in "galls" or excretions produced by the larvae of different insects which feed off leaf material. The plant is monoecious and wind pollinated. *Q. dilatata* grows well in medium (loamy) and heavy (clay) soils and tolerates a variety of soil pH. It prefers direct sunlight or semi-shade often found in light woodlands, and requires moist soil for optimum growth. The species is also highly tolerant of strong winds. Oak stands are important habitat for Himalayan black bear may also have importance to the Asiatic black bear.

Geographic distribution: *Quercus dilatata* is native to the Himalayas. It is distributed within Afghanistan, Pakistan, and temperate zones in the Himalayas from Kashmir to Nepal.

Typical Use: The seed of *Q. dilatata* is edible when cooked or it can be dried and ground into a powder used for thickening stews or making bread. The seed contains bitter tannins that must be leached before consumption. Leaching is sometimes accomplished by wrapping seeds in cloth and leaving them in streams for days at a time. Roasted seeds may be used as a coffee substitute. Galls resulting from larvae activity are said to be sweet and are commonly consumed in local communities. Galls from *Q. dilatata* leaves are also considered an astringent and may be used to treat hemorrhages, diarrhea, and dysentery.

Q. dilatata shoots and leaves are heavily lopped for fodder for goats and sheep. Its wood is hard and durable, and often used for construction, firewood, and charcoal. Galls are a source of tannin and dye while mulching the leaves has shown to repel slugs and grubs.

Survey Results: *Q. dilatata* was found in 17.6% of all woodlots surveyed. The average volume in stock was 18.5m³ (min: 1.4m³; max: 97.8m³), however stock volumes of up to 244.9m³ were recorded in single cases. We estimate an overall sales volume of 61.6

thousand m³ (14.2%) for the surveyed 58% of Kabul wood markets (106.1 thousand m³ for 100%), used solely as firewood. The species is sold for an average of \$90/m³ and accounts for 5.4% of the overall annual sales value (\$5.5 million for the surveyed 58% of Kabul wood markets and \$9.5 million for 100%).

Main sources for *Q. dilatata* are Khost province (54.9% of annual sales volume; Table 19, see Appendix p. 63) and Paktiya (44.4%). Other sources include Paktika (0.3%), Wardak (0.2%), and Ghazni (0.1%).

Baloot oak (*Quercus baloot*)

Family: Fagaceae

Synonyms: None

Sources: Breckle 2006, eFlora Database

Ecology: *Quercus baloot* is a small evergreen tree that grows between 2.5 and 8m in height. It is usually found between 1,200-3,000m in forests including blue pine (*Pinus wallichiana*). *Q. baloot* forests also contain a rich undergrowth of species including *Amygdalus kuramica* and *Pistacia khinjuk*. The leaves of *Q. baloot* are oblong-ovate and between 2.5-8 cm long. The upper side of the leaf is a dark green while the underside is a much paler green. The acorn is between 1.5-1.7cm long.

Geographic distribution: *Quercus baloot* is a hardy tree species found within the inner valleys of the Himalayas. It ranges across Kashmir, Afghanistan and Pakistan. *Q. baloot* forests in the Afghan province of Panjsher constitute the western-most extension of the Himalayan forest belt. In areas with higher humidity, *Q. baloot* is often replaced by *Q. dilatata*.

Typical Use: *Q. baloot* is used for fodder, fruits and fuel. In Afghanistan, *Q. baloot* forests have been overharvested primarily for fuel in the main cities. Wood is also used for construction purposes and the bark yields tannins.

Survey Results: *Q. baloot* was the second most sold timber species in Kabul wood markets (30.6% of annual sales volume; exceeded only by *Juniperus excelsa*: 33.8%; and followed by *Populus nigra*, 15.3%), sold at almost half of all woodlots surveyed (46.4%). The average volume in stock was 13.8m³ (min: 0.7m³; max: 104.5m³), however stock volumes reached 261.3m³ in single cases. The annual sales volume is estimated to reach 132.3 thousand m³ (30.6%) for the surveyed 58% of Kabul wood markets (228 thousand m³ for 100%). The species is used almost exclusively as firewood. Only 0.1% is sold as construction wood.

Oak is the second cheapest wood sold in Kabul after juniper (\$51/m³). Average prices/m³ for *Q. baloot* ranged from \$80 - \$94 when sold as firewood, depending on the wood quality. In single occasions, oak is sold as construction wood and then reaches an average price of \$140 per m³. Although representing almost one third of the overall annual sales volume of Kabul wood markets (30.6%), the species only accounts for 11.5% of the annual sales value (\$11.5 million for the surveyed 58% of Kabul wood markets and \$20.1 million).

Q. baloot is primarily drawn from Paktiya province (65.8% of annual sales volume; Table 20, see Appendix p. 64) and Khost (30.2%). Other sources include Paktika (3.7%), and Pakistan (0.3%).

Greek juniper (*Juniperus excelsa polycarpus*)

Family: Cupressaceae

Synonyms: *Juniperus polycarpus*, *Sabina polycarpus*, *Juniperus excelsa*, *Juniperus macropoda*, *Juniperus turcomanica*, *Juniperus seravschanica*, *Sabina seravschanica*, *Juniperus polycarpus* var. *seravschanica*, *Juniperus polycarpus* var. *pendula*, *Juniperus excelsa* var. *farreana*, *Juniperus excelsa* var. *polycarpus*, *Juniperus excelsa* subsp.

polycarpus var. *pendula*, *Juniperus excelsa* subsp. *seravschanica*, *Juniperus excelsa* subsp. *turcomanica*

Sources: Breckle 2006, The Gymnosperm Database, Plants for a Future Database

Ecology: *Juniperus excelsa* subsp. *polycarpus* is a slow-growing evergreen species occurring in drier regions of the Himalayas between 1500-4200m. It is dioecious (male and female flowers occur on separate plants) and wind pollinated, with seeds ripening in October. Young trees have a smooth reddish-brown bark that furrows and peels in long strips as the bark ages. Adults have a reddish-purple bark and grow to a height of about 20m. Leaves are light green to yellow-green and female cones are larger but with less seed than in other subspecies (e.g. *Juniperus excelsa*). *J. excelsa* subsp. *polycarpus* grows well in light (sandy), medium (loamy), and heavy (clay) soils that are well drained. It is shade intolerant, can grow in heavily alkaline soils, and tolerates drought. Trees generally grow on rocky slopes in association with *Juniperus semiglobosa*.

Geographic distribution: *Juniperus excelsa* subsp. *polycarpus* ranges from Afghanistan to Nepal. To the west, it is distributed as far as eastern Turkey and ranges across the Caucasian Region to the Caspian Sea. From the Caspian Sea, the species extends eastward along the Kopet Mountains into Afghanistan. It can be found as far northeast as the Tian Shan and mountains of Kyrgyzstan and as far southeast as Quetta, Pakistan and Himachal Pradesh in India. The species is also found in Iran and there is a disjunct population on Jabal-al-Akhdar in Oman. (Farjon 1992 in The Gymnosperm Database).

Typical Use: Wood from *Juniperus excelsa* subsp. *polycarpus* is moderately hard, even-grained and fragrant. It is considered a high-quality wood used for construction and fuel, while the bark is often used for roofing. Smoke from the branches is used in India as a treatment for delirium from fever and the fragrant wood is used to make incense. Crushed foliage gives off a warm resinous scent and may be used for potpourri. The fruit may be eaten either raw or cooked.

Survey Results: *J. excelsa* was found most in Kabul wood markets (33.8% of annual sales volume; followed by *Quercus baloot*: 30.6%, and *Populus nigra*: 15.3%). About 2/3 of all woodlots surveyed (62.1%) sold juniper. The average stock volume was 14.3m³ (min: 0.5m³; max: 89.6m³). However, stock volumes of up to 161.8m³ were recorded in single cases. We estimate an overall annual sales volume of 146.4 thousand m³ (33.8%) for the surveyed 58% of Kabul wood markets (252.4 thousand m³ for 100%). The species is used to 99.4% for fuel, only 0.6% is sold as construction wood.

Juniper, sold as firewood, is the cheapest timber species in Kabul's markets. It sells for no more than an average \$51/m³. However, when sold as construction wood its value rises to considerably, reaching \$405/m³ with a price range from \$377 to \$442/m³ depending on wood quality. Although it makes about one third (33.8%) of the overall sales volume of Kabul wood markets it only accounts for 7.8% of the overall sales value (\$8 million for the surveyed 58% of Kabul wood markets and \$13.7 million).

J. excelsa is primarily originating from Paktiya province (62.4% of annual sales volume; Table 21, see Appendix p. 64) and Khost (35.3%). Other sources comprise Paktika (1.4%), Pakistan (0.4%), Kunar (0.2%), and Wardak (0.1%).

Lombardy Poplar or "Chinar Arhar" (*Populus nigra*)

Family: Salicaceae

Synonyms: *Populus pyramidalis*, Black poplar, Pyramidal poplar

Sources: Plants for a Future Database, UCONN Database

Ecology: *Populus nigra* is a deciduous tree known for its rapid growth rate. It is dioecious with flowering occurring in April and seeds ripening in June. A typical characteristic for the tree is its columnar shape giving it the secondary name of Pyramidal poplar. Leaves are

deltoid shaped and alternate, bright green in color and about 5-10cm in length. In younger trees, bark is grey-green but becomes blackened and furrowed with age. In fall, leaves turn a brilliant yellow before dropping while catkins in the spring are generally red. The tree is wind pollinated and noted for attracting wildlife. It grows well in light (sandy), medium (loamy), and heavy (clay) soils that are well-drained. It is shade intolerant and requires copious amounts of sun for optimal growth. *P. nigra* tolerates heavy winds and is planted in the United States as a windbreak and along fencerows. In Afghanistan, *Populus* plantations are planted as an agricultural crop and harvested 8 years after planting.

Geographic distribution: *P. nigra* is found within central and southern Europe, Turkey, and temperate regions in the Himalayas. Trees are often planted for decorative purposes in the United States.

Typical Use: *P. nigra* has soft, light, and woolly wood that lacks taste or smell. It is not durable but is easy to work and resists abrasion. Thus, as timber it is used for lower quality purposes. It has low flammability and does not make a good fuel source. Bark may be used as a cork substitute. The tree is often used as a screen or windbreak due to its tolerance of high winds and rapid growth rate.

The inner bark of *P. nigra* can be dried and ground into a fine powder that may be added to flour to make breads. Leaf buds of almost all poplars contain salicin, a glycoside which decomposes in the body to make salicylic acid (aspirin). Buds can be taken to treat bronchitis, upper respiratory tract infections, and stomach and kidney disorders. Externally, buds can be ground or put in hot water to treat colds, arthritis, rheumatism, muscular pain, dry skin, and congestion. These buds are usually harvested in spring and dried for later use.

The bark of *P. nigra* is an anodyne (pain reliever), anti-inflammatory, antiseptic, astringent, diuretic, and tonic. Bark is harvested from side branches and dried. It is used to treat gout, lower back pain, urinary infections, fevers, and menstrual cramps. Externally, bark may be applied to haemorrhoids, infected wounds and sprains to relieve pain.

Survey Results: *P. nigra* was the third most sold timber species in Kabul wood markets (30.6% of annual sales volume; exceeded only by *Juniperus excelsa*: 33.8%; and followed by *Populus nigra*, 15.3%), found at 1/4 of all woodlots surveyed (25.8%). The average volume in stock was 23.0m³ (min: 0.2m³; max: 123.2m³), however stock volumes of up to 415.9m³ were recorded in single cases. The estimated annual sales volume is estimated to reach 66.2 thousand m³ (15.3%) for the surveyed 58% of Kabul wood markets (114.1 thousand m³ for 100%). It is sold almost entirely in round logs (98.8%) versus sawn lumber (1.1%) for construction use.

Growing Lombardy poplar is the most lucrative source within the timber trade in Kabul's market. The species sells for an average of \$216/m³ and thus ranges only in the mid to even low price level gained for construction wood in Kabul. However it provides by far the biggest share of construction wood. Representing only 15.3% of the overall annual sales volume of the Kabul wood markets, it accounts for no less than 47.6% of the overall sales value (\$48.3 million for the surveyed 58% of Kabul wood markets and \$83.2 million for 100%).

P. nigra is mainly drawn from Ghazni province (52.4% of annual sales volume; Table 2264), Bamyan (22.2%), and Wardak (11.6%). Other sources comprise Logar (6.0%), Pakistan (4.6%), Parwan (1.2%), Kabul (0.7%), Pakiya (0.5%), Balkh (0.3%), Uruzgan (0.2%), Daikondy (0.1%), Khost (0.1%), and Kunduz (0.1%).

Himalayan Poplar or "Chinar Rima" (*Populus ciliata*)

Family: Salicaceae

Synonyms: *Populus pyramidalis*, *Populus rotundifolia*

Sources: AgroForestry Database, Plants for a Future Database

Ecology: *Populus ciliata* is a deciduous tree growing between 1200-3000m in mixed forests with *Quercus* spp., *Cedrus* spp., and *Pinus* spp. It is also a fairly fast-growing species known

to grow in secondary forests by streams. *P. ciliata* is dioecious and wind pollinated. Bark on younger trees is smooth and green-grey, but turns to dark brown and develops vertical fissures as the tree ages. Leaves are broadly ovate ranging from 7.5-18cm. *P. ciliata* grows in light (sandy), medium (loamy), and heavy (clay) soils but demonstrates poor growth on soils with hard or impervious layers underneath. The plant does not tolerate alkalinity and grows well on slightly acidic or neutral soils. In the natural range of its distribution, *P. ciliata* prefers moist cool places in direct sun, although it does exist on dry slopes where the growth is generally very poor.

Geographic distribution: *P. ciliata* ranges from Kashmir to Bhutan and within western China. It is native to India and Pakistan, and considered an exotic in Afghanistan, China, France, Iran, Italy, Japan, Nepal, New Zealand, and the United States.

Typical Use: Wood from *P. ciliata* is soft and woolly without taste or smell. It is not durable but resists abrasion, and has been compared in finishing quality to teak. It is used to make writing paper, boxes, matches, and for planking. It may also be used for timber construction and making furniture. During times of scarcity, the tree is lopped for fodder for livestock while prunings are used as fuelwood. *P. ciliata* is excellent for erosion control and is used extensively in China, Japan, the United States, and New Zealand to bind soil.

Bark of *P. ciliata* is used as a blood purifier and a tonic. The bark also makes a paste which when mixed with the ash of cow dung can be used as a poultice to treat muscular swelling. Like other poplars, *P. ciliata* contains salicin in the bark which can be converted to salicylic acid (aspirin) in the body. Thus, the bark may be a possible anodyne, anti-inflammatory and febrifuge.

Survey Results: *P. ciliata* was sold at 8.6% of all woodlots surveyed. With only one outstanding lot with 105.8m³ in stock, the average stock volume was 12.2m³ (min: 0.3m³; max: 70.6m³). We estimate the annual sales volumes as 7.1 thousand m³ for the surveyed 58% of Kabul wood markets (12.3 thousand m³ for 100%). The species is exclusively sold for construction use, with 98.5% occurring as round logs versus 1.5% as sawn lumber.

The species sells for an average of \$237/m³. Making only 1.6% of the overall annual sales volume of the Kabul market it accounts for 10.3% of the overall sales value (\$10.4 million for the surveyed 58% of Kabul wood markets and \$18 million for 100%).

Prime sources for *P. ciliata* are Wardak province (27.6% of annual sales volume; Table 23, see Appendix p. 65), Ghazni (20.4%), Bamiyan (19.9%), and Logar (18.0%). Other sources comprise Pakistan (8.2%), Parwan (5.4%), Russia (0.2%), Paktiya (0.1%), Sari Pul (0.1%), and Balkh (0.1%)

White poplar or "Chinar Safit" (*Populus alba*)

Family: Salicaceae

Synonyms: None

Sources: FAO Report, Plants for a Future Database, UCONN Database

Ecology: *Populus alba* is a deciduous tree with a rapid growth-rate and wide dispersal ability. Adult trees release thousands of wind-dispersed seeds allowing *P. alba* to quickly spread to new areas. Adult trees attain heights ranging from 18-30m. *P. alba* is dioecious and flowers in March. The bark is a showy white and smooth in younger trees, but becomes ridged and furrowed with age. Leaves are alternately arranged, dark green, and about 5-12cm long. *P. alba* grows well in moist, well-drained, deep loam but can also grow in heavy clay. The tree is salt and drought tolerant although it requires full sunlight for growth. *P. alba* is a demonstrated invasive in Connecticut, USA where it escaped from cultivation. It is an especially strong competitor because it can grow in a variety of soils and resprout easily in response to damage.

Geographic distribution: *Populus alba* ranges from central Europe to Asia including China, Eurasia, Iraq, Italy, and Turkey.

Typical Use: Wood from *P. alba* is woolly in texture and lacks taste or smell. It has low flammability and is not durable. However, it is resistant to abrasion, light, soft, and elastic – thus, it is used to make lower quality wood products like matches and packing material. It is also used for fuel and fodder. The bark produces a yellow dye and as a fairly wind resistant tree, *P. alba* can be used to form part of a shelterbelt. The wide crown has made *P. alba* a popular choice for use as shade trees and in urban settings.

The inner bark may be dried and ground into powder to make breads. The bark also contains salicin, which forms salicylic acid in the body. Like other poplar species, the bark may be used as an anodyne, anti-inflammatory, or as a febrifuge.

Survey Results: *P. alba* was sold only in 15 woodlots (0.9%) of the 1,719 surveyed. The average volume in stock was 13.3m³ (min: 0.3m³; max: 52.2m³), reaching an estimated annual sales volume of 2.1 thousand m³ of the surveyed 58% of Kabul wood markets (3.6 thousand m³ for 100%). Almost all white poplar is sold as construction wood (99.3%), with 73.9% round logs versus 25.4% sawn lumber. Only 0.7% is sold as firewood.

White poplar sells for an average of \$143/m³ and thus is the cheapest of all construction wood species found in Kabul wood markets, contributing 0.5% both, to the overall annual sales volume and sales value (\$530 thousand for the surveyed 58% of Kabul wood markets and \$914 thousand for 100%).

Prime sources for *P. alba* are Wardak province (59.6% of annual sales volume; Table 24, see Appendix p. 65) and Pakistan (22.9%). Other sources include Bamyan (6.7%), Logar (2.0%), Pakiya (0.7%), Russia (0.2%), and Kabul (0.2%).

Siberian larch or "Khar-e-rosh" (*Larix sibirica*)

Family: Pinaceae

Synonyms: Russian larch

Sources: The Gymnosperm Database, Plants for a Future Database

Ecology: *Larix sibirica* is a deciduous tree occurring in mountainous regions and lowland taiga from 300-3500m in elevation. The flowers are monoecious blooming from April to May while the seeds ripen in October and November. Male flowers are typically yellow while female flowers are reddish green. The bark is a smooth silver-grey to grey-brown on younger trees, but furrows and turns reddish-brown to brown as it ages. Leaves are 2.5-5cm, slender, and sharp-pointed. Leaf color changes from light green in spring to dark green in summer to a brilliant yellow in the fall as they drop. Adult trees grow to about 30m in sandy, loamy and clay soils. It is fast growing for a conifer but requires ample sunlight with little to no shade. When fully dormant, *L. sibirica* can withstand heavy cold but frost can seriously damage trees if they enter a premature growth stage due to brief spells of warm weather.

Geographic distribution: *Larix sibirica* occurs in boreal circumpolar lowlands in Alaska, Canada and Russia, and at moderate to high altitudes in the United States, Europe, Mongolia, northeastern China, North Korea and central Japan.

Typical Use: Wood from *L. sibirica* is heavy, durable and rot-resistant. The timber is heavily used for construction, bridge-building, pole-making and furniture.

Survey Results: *L. sibirica* was found in 4.6% of the woodlots surveyed. The average volume in stock was 12.5m³ (min: 0.6m³; max: 77.9m³), however stock volumes reached 200m³ in single cases. Annual sales volumes are estimated to reach 11.8 thousand m³ for the surveyed 58% of Kabul wood markets (20.3 thousand m³ for 100%). The species is sold entirely as sawn lumber for construction.

Larch gains mid level prices compared to other species providing construction wood, selling for an average of \$260/m³. Prices range from \$192 to \$286/m³ depending on wood quality. Taking a share of 2.7% of the overall annual sales volume it accounts for 4.3% of the annual

sales value (\$4.4 million for the surveyed 58% of Kabul wood markets and \$7.5 million for 100%)

Reportedly Russia provides the main share of *L. sibirica* (99.2% of annual sales volume; Table 25, see Appendix p. 65). However, as the expenses seem unreasonable high for importing larch from Russia, there are legitimate doubts that this might be in fact another species.

Willow or "Bid-e-watani" (*Salix wallichiana*)

Family: Salicaceae

Synonyms: None

Sources: eFlora Database, Plants for a Future Database

Ecology: *Salix wallichiana* is a deciduous tree or small shrub occurring between elevations of 1500-3600m. Generally, these plants may be found along streamsides or in shrubberies reaching about 1.0m in height. *S. wallichiana* has bee-pollinated dioecious flowers that bloom before or with leaf re-growth. Leaves are ovate or oblong lanceolate, 0.5-1.7cm long, and silky on both sides. It is a fast growing tree and listed by the United States Department of Agriculture as a noxious, invasive and injurious weed in the United States. The plant grows well in many soil types with a pH ranging from acidic to neutral. *S. wallichiana* requires moderate to heavy soil moisture and direct sun for optimum growth. Trees can withstand heavy frosts and prefer cooler zones in the Northern Hemisphere.

Geographic distribution: *Salix wallichiana* is distributed from eastern Asia (China) to the Himalayas. It may be found in Afghanistan, Pakistan, Kashmir, India, Nepal, Bhutan, Tibet, northern Myanmar, and China.

Typical Use: Wood from *S. wallichiana* is flexible and often used in basket weaving. In local communities, twigs are used as toothbrushes. The inner bark may be eaten raw or cooked, and can also be dried into a powder and added to cereal flour to make bread. Young shoots may also be cooked and eaten although they have an intense bitter flavor. Fresh bark contains salicin which turns to salicylic acid (aspirin) in the body. It may be used as an anodyne or febrifuge.

Survey Results: *S. wallichiana* was found in only 9 woodlots (0.6%) of the 1,719 surveyed. Stock volumes reached 41.4m³ in one lot, the average volume in stock, however, was only 2.6m³ (min: 0.7m³; max: 5.9m³). Annual sales volumes are estimated as 0.3 thousand m³ for the surveyed 58% of Kabul wood markets (0.5 thousand m³). 95.1% is sold as round logs for construction. Only 4.9% are sold as firewood.

Willow sells for an average of \$158/m³ and thus is one of the cheaper construction woods. Its price however ranges depending on wood quality from \$182 to \$197/m³. It only has a small market share in both, annual sales volumes and values (0.1% respectively; \$71 thousand for the surveyed 58% of Kabul wood markets and 122.6 thousand for 100%).

S. wallichiana is primarily drawn from Ghazni province (63.2% of annual sales volume; Table 26, see Appendix p. 65), Logar (18.0%), and Wardak (12.4%). Other sources include Kabul (5.2%) and Bamyan (1.1%).

West Himalayan Silver Fir or "Achar" (*Abies webbiana* var. *pindrow*)

Family: Pinaceae

Synonyms: *Abies webbiana* var. *pindrow*, *Pinus pindrow*

Sources: eFlora Database, The Gymnosperm Database, Plants for a Future Database

Ecology: *Abies pindrow* is a slow-growing evergreen tree occurring on northern-facing slopes from 2000-3000m in elevation. It is a wind-pollinated, monoecious tree with seeds ripening in October and November. *A. pindrow* tolerates deep shade, often occurs in dense

forests, and grows to about 30m in height. Young trees are slow to establish because they are often damaged by frost and grow more slowly if steeped in deep shade. *A. pindrow* is found in association with *Picea smithiana* and less frequently with *Cedrus deodara* and *Pinus wallichiana*. On young trees, the bark is a smooth grey which furrows and turns grey-brown with age. Branches are generally short and the needles are 3-6cm long, dark green, and glossy in texture. *A. pindrow* produces cylindrical cones and seeds that are generally 1-1.2cm in length. The plant grows in all soil types but is noted for its ability to grow in heavy clay soil and requires moist soil for optimum growth. It prefers acidic or neutral soils and can grow in deep shade, semi-shade, or no shade.

Geographic distribution: *Abies pindrow* occurs in the western Himalayas from Afghanistan to western Nepal in temperate regions.

Typical Use: Wood from *A. pindrow* is light, soft and not durable. However, its timber is used for building furniture, house interiors, bridges, matches, beams, and water troughs. Branch wood can be used for fuel and burning. Leaves may be used as a tea substitute or for packaging fruit in crates. Cones are used as fuel and decoration.

Survey Results: *A. webbiana* var. *pindrow* was sold only at 8 woodlots (0.5%) of 1,719 surveyed. The average stock volume was 13.8m³, however, stock volumes ranged from 0.4m³ up to 42.6m³. The annual sales volume is estimated as 0.6 thousand m³ for the surveyed 58% of Kabul wood markets (1 thousand m³ for 100%). Fir is solely sold as round logs for construction use.

Fir is the third most expensive wood sold in Kabul wood markets, reaching average prices up to \$444/m³ (exceeded only by *Cedrus deodara*: \$546/m³ and by *Picea smithiana*: \$480/m³). Representing only a share of 0.1% of the overall annual sales volume it accounts for 1.1% of the annual sales value (\$1.1 million for the surveyed 58% of Kabul wood markets and \$1.8 million for 100%).

Prime source for *A. webbiana* var. *pindrow* is Pakiya (78.1% of annual sales volume; Table 28, see Appendix p. 66). Other sources comprise Pakistan (14.2%) and Khost (7.7%).

Chalghoza Pine (*Pinus gerardiana*)

Family: Pinaceae

Synonyms: None

Sources: eFlora Database, The Gymnosperm Database, Plants for a Future Database

Ecology: *Pinus gerardiana* is a slow-growing evergreen usually found growing on limestone in the dry inner ranges of the Himalayas within temperate forests ranging from 2000-3350m in elevation. It occurs with *Cedrus deodara*, *Juniper excelsus* subsp. *polycarpus*, and *Quercus ilex*. It is a wind-pollinated, monoecious plant with flowers blooming from May to June and seeds ripening in October. The bark is flaky and peels in long strips revealing a grayish green color underneath. Branchlets are a smooth olive green. Leaves occur in fascicles of three and are 6-10cm long. Cones are about 12-20cm in length and seeds are a little longer than 2cm. *P. gerardiana* grows well in sandy, loamy and heavy clay soil as long as they are well drained, and can succeed in nutritionally poor soils. It prefers acidic or neutral soils, requires full sunlight, and can withstand drought conditions.

Geographic distribution: *Pinus gerardiana* occurs from Afghanistan to the northwestern Himalayas. It is distributed within eastern Afghanistan, northern Pakistan, India, Kashmir, and Tibet.

Typical Use: *Pinus gerardiana* is perhaps the most useful tree species in Afghanistan. All pines contain oleo resins in their bark, although not in quantities that would make extraction economically worthwhile. Oleo resins are about 20% turpentine, a solvent used for making waxes, varnishes, and medicines, which is obtained from tapping or distillation of the wood. Once turpentine has been extracted, the remaining resin can be used to make rosen (used by violinists to wax their bows) and pitch (used for waterproofing and as a wood

preservative). Bark may be used for making baskets and water buckets, and the needles supply a tan or green dye. Terpene, a substance which inhibits germination of some plants, is also released from the needles during rain storms.

The seeds of *P. gerardiana* are edible either raw or cooked. They are rich in oil, large (up to 25cm), and used like pistachio nuts. *P. gerardiana* nuts constitute an important local food source and are intensely harvested by communities. For example, in the Suleiman Mountains of Pakistan, almost 13,000 indigenous local people derive income from the fall nut harvest. *P. gerardiana* nuts are considered a great delicacy and harvest pressure is so extensive over most of its range that natural regeneration is almost non-existent. A vanillin flavoring is also obtained as a by-product from resins released from pulpwood.

P. gerardiana also provides many medicinal products. The seeds act as an anodyne and a stimulant. Oil from the seeds is used for dressing wounds, on ulcers, and as a treatment for "head diseases". Turpentine is obtained from the resin of all pine trees and acts as an antiseptic, rubefacient (increasing blood circulation), a diuretic, and a vermifuge (expels worms and parasites). Internally, turpentine has been used to treat kidney and bladder problems. Externally, it can be worked into a rub or steam bath for treating rheumatism, coughs, colds, influenza and Tuberculosis. Turpentine can also be applied to help heal wounds, sores, burns and boils.

Survey Results: *P. gerardiana* was found in only 10 woodlots of 1,719 surveyed (0.6%). The average stock volume was 7.6m³ (min: 1.0m³; max: 17.4m³), besides one lot with a recorded stock volume of 90.0m³. The annual sales volume is estimated as 0.5 thousand m³ for the surveyed 58% of Kabul wood markets (0.8 thousand m³ for 100%). The species is sold mainly for construction use (83.0%; 77.6% round logs versus 5.4% sawn lumber). 17% are used as firewood.

This pine species is among the cheap construction wood species found in the Kabul wood market. Selling for an averaged \$151/m³, only *Populus alba* is cheaper (\$143/m³). It contributes 0.1% to the overall annual sales volume and 0.9% to the annual sales value (\$0.9 million for the surveyed 58% of Kabul wood markets and \$1.6 million for 100%).

P. gerardiana is primarily derived from Pakistan (44.9% of annual sales volume; Table 28, see Appendix p. 66) and Pakiya (40.3%). A smaller share originates from Khost province (14.8%).

Himalayan or Bhutan Pine (*Pinus wallichiana*)

Family: Pinaceae

Synonyms: *Pinus griffithii*, *Pinus excelsa*, *Pinus chylla*, Himalayan Blue Pine

Sources: The Gymnosperm Database, Plants for a Future Database

Ecology: *Pinus wallichiana* is a fast-growing evergreen species occurring in drier areas of the Himalayas from about 1800-4300m. It is also commonly found in wetter secondary forests. *P. wallichiana* grows in association with *Cedrus deodara*, *Abies pindrow*, *Picea smithiana*, and *Juniperus excelsa* subsp. *polycarpus* as well as broadleaf species like *Quercus*, *Betula* and *Acer*. It is monoecious and wind-pollinated, with flowering occurring in May and June and seeds (7mm in length) ripening by October. The bark is smooth in young trees but becomes deeply fissured with age. Branches occur in regularly spaced whorls and leaves (15-20cm) grow in fascicles of 5. Cones may be found in groups as large as 6 and are between 20-30cm long. *P. wallichiana* grows in a variety of soil types including heavy clay and nutritionally poor soils, although it requires well drained soil and sunlight for optimum growth. It is drought and wind tolerant and a dominant species in dry areas of the Himalayas.

Geographic distribution: *Pinus wallichiana* is distributed in valleys and foothills along the southern flank of the Himalayas from Afghanistan to Myanmar. It occurs throughout Afghanistan, Pakistan, India, Tibet, Nepal, and from Bhutan to Myanmar.

Typical Use: Wood from *P. wallichiana* is rich in resins and acts as a commercial source of turpentine and tar. It may also be splintered to create torches. Wood is moderately hard and durable, and is used in construction and carpentry. It makes an excellent fuelwood; however, burning wood gives off a pungent smoke.

The seed may be eaten raw or cooked. A honeydew type substance may be obtained from aphid-infested leaves and eaten as manna. There is also a manna-like substance which is secreted from leaves and twigs that can be eaten or used like honey. A vanillin flavoring is obtained from resins released from pulpwood. Like *P. gerardiana*, wood from *P. wallichiana* also contains turpentine and has many medicinal benefits. Additionally, wood from *P. wallichiana* acts as a diaphoretic and stimulant used to treat burns, coughs, fainting and ulcers.

Survey Results: *P. wallichiana* was found at 1.6% of all woodlots surveyed. The average stock volume was 6.7m³ (min: 0.7m³; max: 22.4m³), from one lot a stock volume of 57.7m³ was recorded. The annual sales volume is estimated as 0.8 thousand m³ for the surveyed 58% of Kabul wood markets (1.4 thousand m³ for 100%). The species is sold solely for construction use with 95.2% round logs versus 4.8% sawn lumber.

Himalayan/ Bhutan pine ranges in the upper price level of construction wood. It is sold for an average price of \$358/m³, however ranges between \$218 to \$397/m³ depending on wood quality. It takes a share of only 0.2% of the overall annual sales volume, however accounts for 4.4% of the annual sales value (\$4.5 million for the surveyed 58% of Kabul wood markets and \$7.7 million for 100%).

Prime source for *P. wallichiana* is Pakistan (68.1% of annual sales volume; Table 29, see Appendix p. 66). Other sources are Khost province (14.7%), Paktiya (13.0%), Kunar (3.0%) and Ghazni (1.3%).

West Himalayan spruce (*Picea smithiana*)

Family: Pinaceae

Synonyms: *Picea morinda*, *Pinus smithiana*, Morinda Spruce

Sources: eFlora Database, The Gymnosperm Database, Plants for a Future Database

Ecology: *Picea smithiana* is a slow-growing evergreen occurring on northern and western facing aspects from 2100-3600m in elevation. It is often found in drier areas in association with *Abies pindrow* and *Cedrus deodara*. The plant is monoecious and wind pollinated, with seeds ripening from October to November. Bark is a dark grey-brown and leaves are about 2.5 cm in length. Seeds are between 5-6mm in length and a dark grey color. *P. smithiana* grows in a variety of soil types with various pH, but can succeed in nutritionally poor or highly acidic soils. It requires full sunlight and abundant moisture at the roots for optimal growth, and tolerates heavy winds. Young trees are slow to establish because they are sensitive to frost until they reach a height of about 1.5m. Adult trees reach a height of about 30m.

Geographic distribution: *Picea smithiana* is distributed throughout the Himalayas from Afghanistan to central Nepal.

Typical Use: Wood from *P. smithiana* is soft to moderately hard and used for construction purposes. It is used to make shingles and crates, and is valued for its pulp to make paper. *P. smithiana* wood makes a decent fuel and good charcoal. The bark is water resistant and is often used for roofing and to make water troughs.

The young male catkins from *P. smithiana* can be eaten raw or cooked and they are also commonly used for flavoring. Immature female cones can be cooked and the central portions when fully roasted are sweet and syrupy. The inner bark may be dried and ground into powder to thicken stews or make bread. Young shoot tips make a tea rich in vitamin C, while the seeds may be eaten but are generally too small to be worth consuming.

Survey Results: *P. smithiana* only occurred in two woodlots of 1,719 surveyed (0.1%), with a respective stock volume of 0.5m³ and 11.6m³. The annual sales volume based on recorded turnover rates is estimated as only little below 30m³ for the surveyed 58% of Kabul wood markets (56m³ for 100%). The species is exclusively sold as round logs for construction use.

Spruce is the second most expensive wood species sold in Kabul markets (\$480/m³; exceeded only by *Cedrus deodara*: \$546/m³ and *Abies webbiana* var. *pindrow*: \$444/m³). Both its market share in terms of overall annual sales volumes and values, however, are marginal (<0.0%, respectively; \$18 thousand for the surveyed 58% of Kabul wood markets and \$31 thousand for 100%).

Khost province provides the main share of *P. smithiana* (98.2% of annual sales volume; Table 30, see Appendix p. 66), a small amount is originating from Paktiya (1.8%).

Date: _____ Survey Member Name(s): _____

Survey Location: City _____ GPS Coordinates: Degrees North _____ Degrees East _____

Market Area (name): _____

Market Type: Firewood _____ Building material _____ Both _____

[illegible]

LIST OF NON-TIMBER FOREST PRODUCTS

Morels, or black mushrooms of the genus *Morchella*, are regarded as among the finest wild fungus' in the world (Royal Roads University, 2005). They are widely gathered in Afghanistan's forests and are (at least historically) traded internationally in large quantities. Urban entrepreneurs buy them from local collectors and transport them in dried form to overseas markets, especially to Europe, where demand for them as gourmet or specialty foods consistently exceeds local or regional supplies. Prices are uniformly high (FAO, 2001).

Morels offer a significant income source to forest users and others in the trade-chain. Although harvest levels and economic value haven't been assessed in Afghanistan, a case study from Pakistan's Hindu-Kush (Hamayun et. al., 2006) found, on average, a collector received US\$50 per kilo, local wholesalers US\$160, US\$215 per kilo was fetched at national markets and US\$400 at international market.

Kernels of **Chalghoza pine** (*Pinus gerardiana*) are a popular food in Pakistan, Afghanistan, India and many Middle Eastern countries. Chalghoza pine is a medium-sized tree, growing naturally at an elevation of 1,800 to 3,000 meters in the dry temperate forests of Afghanistan (also Pakistan and India). One tree yields between 20 to 40 kilograms of nuts. Production varies from year to year, with good seed production cycles occurring every fifth year (FAO, 2001). According to the National Progress Reports on Forestry, Asia-Pacific Forestry Commission (15th Session, Colombo, Sri Lanka) production estimates for the years 1990, 1991 and 1992 were reported to be 868, 715 and 435 tons, respectively (FAO, 2001). Most of the production comes from Afghanistan and Pakistan. The market value in Kabul is US\$15/kg; based on the production average across 1990, 1991 and 1992 (672.66 tons), this represents a value of US\$10 million.

Historically, annual production of **pistachio nuts** in Afghanistan was roughly 2,000 tons (FAO, 2001). Today production has declined significantly, largely due to destruction of trees and irrigation systems in recent times (ICARDA, 2008). Irrespective, annual production is still estimated at around 1,300 tons, carrying an export value of US\$130 million. There are a number of producing countries around the world, however, Afghanistan's pistachios are considered to be of highest quality for taste and fetch a higher price. They are also favoured above other countries because they grow naturally without need of fertilizer and pesticides (Saba, 2001).

Liquorice (*Glycyrrhiza* spp.) is supplied mostly from Spain, Turkey, Syria, Iraq and Afghanistan. Much of the production, including Afghanistan, comes from natural forests (FAO, 1995). Lewington (1993) found it has many uses ranging from foodstuffs, medicine to industrial chemicals (FAO, 1994). Husain (1991) found global production between 40,000 and 50,000 tons per annum (FAO, 1994). In 1992 Afghanistan accounted for 7.3 percent of global production, or approximately \$16.5 million (FAO, 1994).

Gum tragacanth (or goat thorn bushes) is produced by several shrubby plants of the *Astragalus* genus. Native to the highlands from Turkey to Afghanistan, it is an important commercial gum, being an excellent emulsifier with wide uses in pharmaceuticals, cosmetics, textiles and food production (Gentry et. al. 1990). The exudate is produced spontaneously on the bark of the shrub, but making an incision and driving wooden wedges into it often increase the yield. It has huge potential to generate income and employment, particularly if commercially cultivated (CSE, 2001). Iran is the main regional producing country. Small quantities are also produced in Afghanistan, but export consignments are rare. Total world trade is around 400 tons. The EC, USA, Japan and former USSR are the major importing regions (FAO, 2001).

Asafoetida is a hard resinous aromatic gum native to Afghanistan and Iran. The product is one of the few examples besides tragacanth gum of an exudate, which is obtained by "tapping" the roots of a shrubby plant, producing a latex. It has been a highly sort product for

millennia; ancient Indian Sanskrit (circa 200 BC) mentions the import of asafoetida from Afghanistan (Ramachandran, undated). According to national statistics, historically Afghanistan was by far the largest supplier of *F. assafoetida* to India, averaging 525 tons annually (FAO, 1995). A 1993 estimate put the value of the world market for gums used as food additives at around US\$10 billion in (FAO, 1995).

Several species of **wildlife** also make the eastern forests home, many of which provide an additional source of protein and fur for local consumption or trade. Predator species, such as snow leopard, lynx, Asiatic black bear, brown bear are not consumed, but they are hunted for their fur which command a relatively high price on the market in Kabul and across the border in Pakistan. Species that represent protein sources include hare, partridge, Urial sheep, Markhor, and Marco Polo sheep. For more information on Wildlife Trade please also see WCS's Wildlife Trade Study, to be published in April 2008.

ADDITIONAL DATA TABLES

Table 6: Composition of Kabul wood markets

Wood market	District code	Number of lots by type of wood sold			Total number of wood lots
		Construction	Firewood	Mixed	
1 Nyaz Beg	5	6	13	0	19
2 Fazal Beg	5	22	4	2	28
3 Seyasank	8	16	27	0	43
4 Abrasy	5	22	26	2	50
5 Company	5	2	7	2	11
6 Dewan Begi	5	9	9	2	20
7 Qalayee Jarnail	5	16	1	1	18
8 Sarahye- Herati	5	10	1	0	11
9 Koti-Sangi	5	3	0	0	3
10 Khoshalkhan Mina	5	1	8	0	9
11 Qismati (A) Khoshalkhan Mina	5	5	1	0	6
12 Speen Keli Khoshalkhan Mina	3	0	8	0	8
13 Afshar	13	6	17	2	25
14 Silo-i-Markazy	13	3	0	0	3
15 Puli Surkh	13	0	15	0	15
16 Labi-Darya Puli-Surkh	13	0	5	0	5
17 Charaye-Qambar	3	0	8	0	8
18 Puli_Sukhta	3	4	4	0	8
19 Charqalah	7	1	5	0	6
20 Qalai-Alimardan	7	1	9	1	11
21 Daybory	7	0	6	0	6
22 Charaye-Shahid Daybory	8	0	9	0	9
23 Golaye-Sarahye- Ghazni	8	0	1	0	1
24 Dashti-Barchi	8	0	2	5	7
25 Puli-Khoshk Dashti-Barchi	12	9	6	2	17
26 Midani-Maktabi Dashti-Barchi	6	0	9	0	9
27 Regi-Roshan Dashti-Barchi	3	1	10	0	11
28 Mantiqa-e-Beestazar Dashti-Barchi	12	4	8	3	15
29 Charaye -Hajinowroz Dashti-Barchi	6	7	8	4	19
30 Dogh Abad Dashti-Barchi	3	1	2	0	3
31 Naqash Dashti-Barchi	13	1	7	0	8
32 Qalai-Jabarkhan Dashti-Barchi	13	2	6	1	9
33 Charaye-Shahid	13	7	9	0	16
34 Dogh Abad	7	2	16	4	22
35 Puli-Hasan Khan	7	0	8	0	8
36 Srak-i-awali Karti-Now	8	9	17	0	26
37 Sar-i-Tapa-i-Karti-Now	8	0	20	4	24
38 Fabreka-i-Nasaji Bagrami	16	10	4	0	14
39 Arzan Qimat	12	8	47	1	56
40 Deh Mazang	3	2	22	0	24
41 Labi-jar Khair Khana	11 & 4	28	3	1	32
42 Sarahye - Shamaly Khair Khana	4	5	23	0	28
43 Tahia-i-Maskan Khair Khana	4	85	0	1	86
44 Sesad-o-Panzda Khair Khana	11	10	29	1	40
45 Pansad Family Khair Khana	15	1	38	0	39
46 Pusta-e-kachalu	15	8	16	0	24
47 Paikub-i-Naswan	10	0	2	0	2
48 Quwai-e-Markaz	2	0	1	0	1
49 Tang-i-Lugar	8	93	20	2	115
50 Qalacha	8	11	182	1	194
51 Chamani-Babrak	4	17	84	1	102
52 Darulaman	7	0	7	0	7
53 Allahudin	6	0	6	1	7

	Wood market	District code	Number of lots by type of wood sold			Total number of wood lots
			Construction	Firewood	Mixed	
54	De Danah	7	3	20	7	30
55	Chelsitoon	7	4	33	1	38
56	Qalayee-Ghaiby	7	0	4	2	6
57	Tanykot	7	0	10	0	10
58	Gozargah	7	46	7	4	57
59	Rahman Mena	8	0	19	1	20
60	Mardet-e-Karta-e-Now	8	0	9	0	9
61	Damana-e-Kamari-e-Bagrami	8	0	7	0	7
62	Chaman-e-Hozory	8	4	1	0	5
63	Bala-e-Hesar	8	6	1	0	7
64	Beni Hesar	8	0	3	0	3
65	Qala-e-Wazir	6	0	4	0	4
66	Shiwaki	6	0	5	0	5
67	Sar-e-Kotal-e-Khair Khana	11	2	31	3	36
68	Qala-i-Fatullah	10	0	8	0	8
69	Qala-i-Musa	10	0	1	0	1
70	Char Qala-i-Wazirabad	10	0	4	0	4
71	Wazirabad	15	0	1	0	1
72	Nomrahay-e-Now-e-Dasht-e-Chamtalah	17	0	3	0	3
73	Kotal-e-Khair Khana	7	0	5	0	5
74	Bagh-e-Raise	11	0	6	0	6
75	Leway-e-Baba Jan	11	1	23	0	24
76	Qala-e-Dahkhudaidad	16	0	9	0	9
77	Qala-e-Zaman Khan	16	0	15	0	15
78	Simant Khana	16	0	3	0	3
79	Charahi-e-Trafic	4	0	1	0	1
80	Gardana-e-Karta-e-Now	8	0	1	0	1
81	Baraki	4	0	2	0	2
82	Astadgha-e-Sabiqa-e-Karta-e-Now	8	0	1	0	1
83	Pul-e-pacha Khan	9	0	1	0	1
84	Yaka Toot	9	0	8	0	8
85	Qabal Bay	9	0	11	0	11
86	Qala-e-Khawaja-e-Yaka Toot	9	0	1	0	1
87	Dou Sarka-e-Astashan-e-Hood Khel	9	0	1	0	1
88	Hood khel	9	0	10	0	10
89	Paktiya kot	7	0	10	0	10
90	Qala-e-Chaman	7	0	2	0	2
91	Qala-e-Mirabas	10	0	2	0	2
92	Qala-e-Wakel	10	0	6	0	6
93	Murorian-e-Charam	9	0	3	0	3
94	Dahan-e-Hamam-e-Bebe Mahrow	10	0	3	0	3
95	Do saraka-e-Miadan hawae	9 & 10	0	2	0	2
96	Moqabal-e-Acadamy-Olam-e-Ordou-e-Mele	10 & 10	0	1	0	1
97	Qala-e-Khyat	9	0	2	0	2
98	Khawaja Rawash	9	0	3	0	3
99	Bolack hay Miadani-e-Hawae	10	0	2	0	2
100	Pul-e-charkhy	12	0	2	0	2
101	Tarakhel	18	0	2	0	2
102	Dehsabz-e-Bakhtyaran	18	0	3	0	3
103	Proja-e-Pange-e-Khair khana	11 & 15	0	4	0	4
104	Hasa-e-Awal-e-Khair Khana	11	0	1	0	1
105	Dasht-e-Chamtala Distrect (17)	17	0	2	0	2

Wood market	District code	Number of lots by type of wood sold			Total number of wood lots
		Construction	Firewood	Mixed	
106 Sarak-e-chahal Metra Kalula pushta	4	0	2	0	2
107 Karta-e-Ariana	2	0	1	0	1
108 Karta-e-Sakhi	3	0	3	0	3
109 Now abad kole abchakan	2	0	3	0	3
110 Dahan-e-Bagh	2 & 4	0	2	0	2
111 Now abad-e-Deh afghanan	3	0	1	0	1
112 Chahal Metra-e-Baghal-e-Haowza-e-Hasht	8	0	4	0	4
113 Bibi Mahro	10	0	5	0	5
114 Bagrami District	12	2	5	0	7
Total		516	1141	62	1719

Table 7: Timber product volumes in Kabul wood markets

Wood market	# of lots	Observed stock volume (m ³)	Reported monthly turnover rate (m ³)	Estimated annual turnover rate (m ³)
1 Nyaz Beg	19	485.7	249.1	2,989.6
2 Fazal Beg	28	1,362.6	222.2	2,666.7
3 Seyasank	43	1,206.6	890.1	10,680.9
4 Abrasy	50	1,697.4	652.2	7,826.7
5 Company	11	361.9	281.4	3,376.7
6 Dewan Begi	20	515.1	145.9	1,750.5
7 Qalayee Jarnail	18	1057.3	174.7	2,096.0
8 Sarahye- Herati	11	425.7	165.0	1,980.1
9 Koti-Sangi	3	26.7	6.5	77.7
10 Khoshalkhan Mina	9	321.6	129.9	1,558.9
11 Qismati (A) Khoshalkhan Mina	6	408.2	177.9	2,135.2
12 Speen Keli Khoshalkhan Mina	8	254.0	180.9	2,171.3
13 Afshar	25	1,302.3	599.4	7,192.8
14 Silo-i-Markazy	3	14.2	2.5	30.0
15 Puli-Surkh	15	828.8	703.9	8,446.3
16 Labi-Darya Puli-Surkh	5	233.5	136.6	1,639.7
17 Charaye-Qambar	8	231.0	46.3	555.5
18 Puli_Sukhta	8	569.7	321.7	3,861.0
19 Charqalah	6	143.4	71.3	855.5
20 Qalai-Alimardan	11	618.2	694.0	8,328.1
21 Daybory	6	192.1	264.6	3,174.8
22 Charaye-Shahid Daybory	9	390.0	357.2	4,285.9
23 Golaye-Sarahye- Ghazni	1	17.2	201.6	2,419.2
24 Dashti-Barchi	7	349.1	143.8	1,725.4
25 Puli-Khoshk Dashti-Barchi	17	689.5	261.5	3,138.6
26 Midani-Maktabi Dashti-Barchi	9	424.6	357.4	4,288.9
27 Regi-Roshan Dashti-Barchi	11	240.0	176.8	2,121.9
28 Mantiqa-e-Beestazar Dashti-Barchi	15	516.2	376.5	4,518.0
29 Charaye -Hajinowroz Dashti-Barchi	19	956.0	291.3	3,495.8
30 Dogh Abad Dashti-Barchi	3	115.2	59.4	712.6
31 Naqash Dashti-Barchi	8	323.9	241.3	2,895.8
32 Qalai-Jabarkhan Dashti-Barchi	9	422.2	296.8	3,561.4
33 Charaye-Shahid	16	477.4	371.3	4,455.2
34 Dogh Abad	22	636.1	470.8	5,649.1
35 Puli-Hasan Khan	8	148.3	138.9	1,666.6
36 Srak-i-awali Karti-Now	26	582.1	476.4	5,609.5
37 Sar-i-Tapa-i-Karti-Now	24	685.0	722.2	8,666.6
38 Fabreka-i-Nasaji Bagrami	14	491.7	135.6	1,627.5
39 Arzan Qimat	56	1,167.9	930.2	11,162.2

Wood market	# of lots	Observed stock volume (m ³)	Reported monthly turnover rate (m ³)	Estimated annual turnover rate (m ³)
40 Deh Mazang	24	1,416.6	1,175.5	14,105.9
41 Labi-jar Khair Khana	32	749.0	851.3	10,215.1
42 Sarahye - Shamaly Khair Khana	28	321.7	297.4	3,569.0
43 Tahia-i-Maskan Khair Khana	86	2,343.5	882.5	10,577.4
44 Sesad-o-Panzda Khair Khana	40	840.7	565.6	6,787.4
45 Pansad Family Khair Khana	39	794.7	721.8	8,661.6
46 Pusta-e-kachalu	24	292.4	158.2	1,897.8
47 Paikub-i-Naswan	2	64.7	52.5	630.2
48 Quwai-e-Markaz	1	13.7	10.0	119.5
49 Tang-i-Lugar	115	3,042.5	3,264.7	39,176.0
50 Qalacha	194	5,613.7	5,548.4	66,581.1
51 Chamani-Babrak	102	3,793.8	2,485.6	29,826.9
52 Darulaman	7	198.1	164.8	1,977.2
53 Allahudin	7	316.7	194.7	2,336.0
54 De Danah	30	847.9	521.5	6,258.1
55 Chelsitoon	38	1,097.2	775.0	9,300.5
56 Qalayee-Ghaiby	6	103.8	62.9	754.6
57 Tanykot	10	418.4	286.5	3,437.7
58 Gozargah	57	2,103.5	960.7	11,528.2
59 Rahman Mena	20	566.1	445.1	5,341.5
60 Mardet-e-Karta-e-Now	9	363.4	266.6	3,198.7
61 Damana-e-Kamari-e-Bagrami	7	348.9	327.5	3,930.5
62 Chaman-e-Hozory	5	55.4	80.4	965.0
63 Bala-e-Hesar	7	115.1	95.7	1,148.0
64 Beni Hesar	3	62.7	35.3	424.1
65 Qala-e-Wazir	4	91.1	53.5	642.1
66 Shiwaki	5	54.3	45.8	549.5
67 Sar-e-Kotal-e-Khair Khana	36	649.7	359.1	4,309.4
68 Qala-i-Fatullah	8	158.5	221.3	2,655.1
69 Qala-i-Musa	1	12.2	18.9	227.0
70 Char Qala-i-Wazirabad	4	70.7	78.9	946.8
71 Wazirabad	1	17.4	30.1	361.4
72 Nomrahay-e-Now-e-Dasht-e-Chamtalah Kotal-e-Khair Khana	3	75.9	39.8	477.9
73 Bagh-e-Raise	5	222.5	113.4	1,360.4
74 Leway-e-Baba Jan	6	195.4	129.7	1,556.1
75 Khwaja Bughra	24	979.3	453.2	5,438.9
76 Qala-e-Dahkhudaidad	9	117.2	139.3	1,671.0
77 Qala-e-Zaman Khan	15	287.8	217.4	2,608.9
78 Simant Khana	3	73.2	40.3	483.8
79 Charahi-e-Trafic	1	61.2	54.8	657.1
80 Gardana-e-Karta-e-Now	1	7.7	11.0	131.4
81 Baraki	2	42.8	29.4	352.4
82 Astadgha-e-Sabiqa-e-Karta-e-Now	1	9.5	33.8	406.2
83 Pul-e-pacha Khan	1	26.6	25.9	310.6
84 Yaka Toot	8	155.3	92.1	1,105.1
85 Qabal Bay	11	133.4	112.2	1,347.0
86 Qala-e-Khawaja-e-Yaka Toot	1	5.0	5.2	62.7
87 Dou Sarka-e-Astashan-e-Hood Khel	1	2.5	17.4	209.1
88 Hood khel	10	162.0	192.5	2,310.2
89 Paktiya kot	10	163.1	175.0	2,099.6
90 Qala-e-Chaman	2	23.0	38.6	462.9
91 Qala-e-Mirabas	2	39.8	56.7	681.0
92 Qala-e-Wakel	6	130.2	54.5	654.1
93 Murorian-e-Charam	3	33.6	65.7	788.5
94 Dahan-e-Hamam-e-Bebe Mahrow	3	41.8	167.5	2,010.0
95 Do saraka-e-Miadan hawae	2	18.4	10.5	125.4
96 Moqabal-e-Acadamy-Olam-e-Ordou-e-Mele	1	3.0	17.4	209.1
97 Qala-e-Khyat	2	49.3	49.3	591.4
98 Khawaja Rawash	3	17.7	54.0	648.1
99 Bolack hay Miadani-e-Hawae	2	35.0	52.3	627.2
100 Pul-e-charkhy	2	35.6	11.0	131.4

Wood market	# of lots	Observed stock volume (m ³)	Reported monthly turnover rate (m ³)	Estimated annual turnover rate (m ³)
101 Tarakhel	2	28.1	15.3	183.7
102 Dehsabz-e-Bakhtyaran	3	19.9	9.5	113.5
103 Proja-e-Pange-e-Khair khana	4	35.1	7.5	89.6
104 Hasa-e-Awal-e-Khair Khana	1	18.2	8.0	95.6
105 Dasht-e-Chamtala Distrect	2	35.1	14.7	176.2
106 Sarak-e-chahal Metra Kalula pushta	2	55.3	40.6	486.8
107 Karta-e-Ariana	1	9.2	31.1	373.3
108 Karta-e-Sakhi	3	30.6	33.8	406.2
109 Now abad kole abchakan	3	24.4	19.9	238.9
110 Dahan-e-Bagh	2	103.0	37.3	448.0
111 Now abad-e-Deh afghanan	1	1.2	2.5	29.9
112 Chahal Metra-e-Baghal-e-Haowza-e-Hasht	4	56.5	57.5	689.9
113 Bibi Mahro	5	100.8	91.8	1,102.1
114 Bagrami District	7	136.0	69.6	781.4
Total	1719	51,627.7	36,061.7	432,565.7

Table 8: Timber product values in Kabul wood markets

Wood market	# of lots	Observed stock value (USD)	Reported monthly turnover rate (USD)	Estimated annual turnover rate (USD)
1 Nyaz Beg	19	62,682.0	27,650.4	331,804.8
2 Fazal Beg	28	263,016.0	38,317.5	459,809.4
3 Seyasank	43	207,898.8	375,492.9	4,505,915.4
4 Abrasy	50	211,959.8	76,571.5	918,858.0
5 Company	11	50,499.4	27,678.0	332,136.0
6 Dewan Begi	20	71,918.6	17,549.4	210,592.8
7 Qalayee Jarnail	18	190,073.1	31,025.0	372,300.0
8 Sarahye- Herati	11	70,280.0	26,964.0	323,568.0
9 Koti-Sangi	3	6,460.0	1,530.0	18,360.0
10 Khoshalkhan Mina	9	24,274.0	10,364.0	124,368.0
11 Qismati (A) Khoshalkhan Mina	6	72,580.0	20,204.0	242,448.0
12 Speen Keli Khoshalkhan Mina	8	17,487.0	14,600.0	175,200.0
13 Afshar	25	116,328.0	110,240.6	1,322,887.2
14 Silo-i-Markazy	3	1,836.0	5,415.2	64,982.4
15 Puli-Surkh	15	57,996.0	50,614.2	607,370.7
16 Labi-Darya Puli-Surkh	5	15,146.0	10,686.0	128,232.0
17 Charaye-Qambar	8	16,428.0	3,566.0	42,792.0
18 Puli_Sukhta	8	54,109.0	36,948.0	443,376.0
19 Charqalah	6	14,668.0	12,032.0	144,384.0
20 Qalai-Alimardan	11	44,043.0	65,704.0	788,448.0
21 Daybory	6	13,402.0	18,780.0	225,360.0
22 Charaye-Shahid Daybory	9	28,716.0	28,746.0	344,952.0
23 Golaye-Sarahye- Ghazni	1	1,364.0	18,740.0	224,880.0
24 Dashti-Barchi	7	47,528.0	104,496.0	1,253,952.0
25 Puli-Khoshk Dashti-Barchi	17	77,550.0	162,792.0	1,953,504.0
26 Midani-Maktabi Dashti-Barchi	9	28,970.0	24,990.0	299,880.0
27 Regi-Roshan Dashti-Barchi	11	17,098.0	20,587.0	247,044.0
28 Mantiqa-e-Beestazar Dashti-Barchi	15	55,276.0	50,962.0	611,544.0
29 Charaye -Hajinowroz Dashti-Barchi	19	111,614.0	189,910.0	2,278,920.0
30 Dogh Abad Dashti-Barchi	3	13,466.0	7,203.0	86,436.0
31 Naqash Dashti-Barchi	8	22,118.0	15,754.0	189,048.0
32 Qalai-Jabarkhan Dashti-Barchi	9	37,555.0	58,773.0	705,276.0
33 Charaye-Shahid	16	515,582.0	55,300.0	663,600.0
34 Dogh Abad	22	54,309.0	108,345.0	1,300,140.0
35 Puli-Hasan Khan	8	9,324.0	7,748.0	92,976.0
36 Srak-i-awali Karti-Now	26	52,478.8	62,253.6	747,043.2
37 Sar-i-Tapa-i-Karti-Now	24	55,509.0	59,970.7	719,648.6
38 Fabreka-i-Nasaji Bagrami	14	241,375.0	164,318.0	1,971,816.0

Wood market	# of lots	Observed stock value (USD)	Reported monthly turnover rate (USD)	Estimated annual turnover rate (USD)
39 Arzan Qimat	56	123,424.0	106,856.5	1,282,278.0
40 Deh Mazang	24	113,356.0	107,802.0	1,293,624.0
41 Labi-jar Khair Khana	32	897,117.0	214,567.7	2,574,812.2
42 Sarahye - Shamaly Khair Khana	28	40,138.0	25,339.0	304,068.0
43 Tahia-i-Maskan Khair Khana	86	3,929,494.8	666,628.0	7,999,536.2
44 Sesad-o-Panzda Khair Khana	40	381,233.0	130,595.0	1,567,140.0
45 Pansad Family Khair Khana	39	63,053.2	67,173.6	806,083.2
46 Pusta-e-kachalu	24	206,815.0	47,787.0	573,444.0
47 Paikub-i-Naswan	2	5,370.0	4,092.0	49,104.0
48 Quwai-e-Markaz	1	1,026.0	810.0	9,720.0
49 Tang-i-Lugar	115	3,264,453.2	1,844,916.2	22,138,994.4
50 Qalacha	194	683,924.0	468,552.0	5,622,624.0
51 Chamani-Babrak	102	590,106.0	426,000.0	5,099,136.0
52 Darulaman	7	13,669.0	12,340.0	148,080.0
53 Allahudin	7	25,577.0	17,805.0	213,660.0
54 De Danah	30	80,516.0	210,419.6	2,525,035.2
55 Chelsitoon	38	79,533.0	77,862.0	934,344.0
56 Qalayee-Ghaiby	6	10,536.0	14,456.0	173,472.0
57 Tanykot	10	30,308.0	19,822.0	237,864.0
58 Gozargah	57	1,047,367.0	1,368,034.5	16,398,654.4
59 Rahman Mena	20	41,188.0	39,279.0	471,348.0
60 Mardet-e-Karta-e-Now	9	27,160.0	19,812.0	237,744.0
61 Damana-e-Kamari-e-Bagrami	7	25,420.0	23,908.0	286,896.0
62 Chaman-e-Hozory	5	83,996.0	51,992.0	623,904.0
63 Bala-e-Hesar	7	170,604.0	43,658.6	523,903.2
64 Beni Hesar	3	4,300.0	2,502.0	30,024.0
65 Qala-e-Wazir	4	6,728.0	3,950.0	47,400.0
66 Shiwaki	5	3,816.0	3,316.0	39,792.0
67 Sar-e-Kotal-e-Khair Khana	36	58,843.0	43,988.2	527,858.6
68 Qala-i-Fatullah	8	12,474.0	17,832.0	213,984.0
69 Qala-i-Musa	1	900.0	1,440.0	17,280.0
70 Char Qala-i-Wazirabad	4	5,770.0	6,432.0	77,184.0
71 Wazirabad	1	1,328.0	2,300.0	27,600.0
72 Nomrahay-e-Now-e-Dasht-e-Chamtalah Kotal-e-Khair Khana	3	5,294.0	3,080.0	36,960.0
73 Bagh-e-Raise	5	15,812.0	8,180.0	98,160.0
74 Leway-e-Baba Jan	6	13,294.0	9,624.0	115,488.0
75 Khwaja Bughra	24	77,883.0	44,177.0	530,124.0
76 Qala-e-Dahkhudaidad	9	7,394.0	8,078.0	96,936.0
77 Qala-e-Zaman Khan	15	18,518.0	13,870.0	166,440.0
78 Simant Khana	3	5,198.0	2,864.0	34,368.0
79 Charahi-e-Trafic	1	4,992.0	4,260.0	51,120.0
80 Gardana-e-Karta-e-Now	1	490.0	700.0	8,400.0
81 Baraki	2	3,092.0	2,120.0	25,440.0
82 Astadgha-e-Sabiqa-e-Karta-e-Now	1	640.0	2,176.0	26,112.0
83 Pul-e-pacha Khan	1	1,618.0	1,696.0	20,352.0
84 Yaka Toot	8	12,034.0	6,178.0	74,136.0
85 Qabal Bay	11	8,722.0	7,862.0	94,344.0
86 Qala-e-Khawaja-e-Yaka Toot	1	418.0	344.0	4,128.0
87 Dou Sarka-e-Astashan-e-Hood Khel	1	138.0	966.0	11,592.0
88 Hood khel	10	9,636.0	12,554.0	150,648.0
89 Paktiya kot	10	12,177.0	12,820.0	153,840.0
90 Qala-e-Chaman	2	1,650.0	2,936.0	35,232.0
91 Qala-e-Mirabas	2	2,624.0	3,584.0	43,008.0
92 Qala-e-Wakel	6	7,992.0	3,148.0	37,776.0
93 Murorian-e-Charam	3	2,766.0	5,390.0	64,680.0
94 Dahan-e-Hamam-e-Bebe Mahrow	3	3,704.0	13,116.0	157,392.0
95 Do saraka-e-Miadan hawae	2	1,216.0	802.0	9,624.0
96 Moqabal-e-Acadamy-Olam-e-Ordou-e-Mele	1	213.0	1,280.0	15,360.0
97 Qala-e-Khyat	2	3,242.0	3,590.0	43,080.0
98 Khawaja Rawash	3	1,656.0	4,456.0	53,472.0
99 Bolack hay Miadani-e-Hawae	2	2,520.0	3,816.0	45,792.0

Wood market	# of lots	Observed stock value (USD)	Reported monthly turnover rate (USD)	Estimated annual turnover rate (USD)
100 Pul-e-charkhy	2	1,876.0	728.0	8,736.0
101 Tarakhel	2	2,368.0	1,352.0	16,224.0
102 Dehsabz-e-Bakhtyaran	3	1,912.0	866.0	10,392.0
103 Proja-e-Pange-e-Khair khana	4	2,936.0	544.0	6,528.0
104 Hasa-e-Awal-e-Khair Khana	1	1,444.0	692.0	8,304.0
105 Dasht-e-Chamtala Distrect	2	2,904.0	1,208.0	14,496.0
106 Sarak-e-chahal Metra Kalula pushta	2	3,670.0	3,090.0	37,080.0
107 Karta-e-Ariana	1	670.0	2,320.0	27,840.0
108 Karta-e-Sakhi	3	1,950.0	1,914.0	22,968.0
109 Now abad kole abchakan	3	1,910.0	1,910.0	22,920.0
110 Dahan-e-Bagh	2	8,372.0	2,886.0	34,632.0
111 Now abad-e-Deh afghanan	1	72.0	144.0	1,728.0
112 Chahal Metra-e-Baghal-e-Haowza-e-Hasht	4	4,024.0	3,774.0	45,288.0
113 Bibi Mahro	5	6,236.0	6,368.0	76,416.0
114 Bagrami District	7	12,396.0	24,625.0	295,500.0
Total	1719	15,259,133.7	8,451,177.0	101,383,499.9

Note: All following tables only show results for the actually surveyed 58% of Kabul wood markets.

Table 9: Timber product volumes by species in Kabul wood markets

Species	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/ annual turnover rate	Estimated annual turnover rate (m ³)
1 <i>Populus nigra</i>	11,615.7	22.5%	5,516.3	15.3%	66,195.4
2 <i>Populus ciliata</i>	1,886.6	3.7%	593.3	1.6%	7,114.6
3 <i>Populus alba</i>	306.2	0.6%	175.0	0.5%	2,099.8
4 <i>Quercus baloot</i>	12,238.3	23.7%	11,033.4	30.6%	132,239.7
5 <i>Quercus dilatata</i>	6,055.1	11.7%	5,130.2	14.2%	61,562.4
6 <i>Pinus gerardiana</i>	151.3	0.3%	39.6	0.1%	475.7
7 <i>Pinus wallichiana</i>	226.2	0.4%	67.8	0.2%	813.1
8 <i>Juniperus excelsa</i>	15,907.9	30.8%	12,201.5	33.8%	146,417.7
9 <i>Larix sibirica</i>	1,594.0	3.1%	981.3	2.7%	11,775.5
10 <i>Abies webbiana</i> var. <i>pindrow</i>	100.1	0.2%	48.0	0.1%	576.4
11 <i>Salix wallichiana</i>	60.4	0.1%	25.3	0.1%	304.2
12 <i>Cedrus deodara</i>	252.3	0.5%	83.2	0.2%	998.1
13 <i>Picea smithiana</i>	12.0	<0.0%	2.7	<0.0%	32.9
14 Pakistan poplar	1,221.5	2.4%	164.0	0.5%	1,960.3
Total	51,627.7	100%	36,061.6	100%	432,565.9

Table 10: Timber product values by species in Kabul wood markets

Species	Observed stock value (USD)	Percentage of stock total	Reported monthly turnover rate (USD)	Percentage of monthly/ annual turnover rate	Estimated annual turnover rate (USD)
1 <i>Populus nigra</i>	10,639,676.9	69.7%	4,021,767.0	47.6%	48,261,204.4
2 <i>Populus ciliata</i>	780,822.0	5.1%	867,568.2	10.3%	10,414,419.0
3 <i>Populus alba</i>	26,570.0	0.2%	44,163.6	0.5%	529,963.2
4 <i>Quercus baloot</i>	1,096,073.8	7.2%	969,556.2	11.5%	11,621,810.7
5 <i>Quercus dilatata</i>	540,970.0	3.5%	459,251.0	5.4%	5,511,012.3
6 <i>Pinus gerardiana</i>	19,327.0	0.1%	77,012.0	0.9%	924,144.0
7 <i>Pinus wallichiana</i>	65,216.2	0.4%	374,395.4	4.4%	4,492,744.8
8 <i>Juniperus excelsa</i>	883,145.6	5.8%	662,646.7	7.8%	7,951,759.9

Species	Observed stock value (USD)	Percentage of stock total	Reported monthly turnover rate (USD)	Percentage of monthly/ annual turnover rate	Estimated annual turnover rate (USD)
9 <i>Larix sibirica</i>	636,314.2	4.2%	366,368.8	4.3%	4,375,065.6
10 <i>Abies webbiana</i> var. <i>pindrow</i>	25,632.0	0.2%	89,180.0	1.1%	1,070,160.0
11 <i>Salix wallichiana</i>	7,496.0	<0.0%	5,924.0	0.1%	71,088.0
12 <i>Cedrus deodara</i>	244,200.0	1.6%	104,870.0	1.2%	1,258,440.0
13 <i>Picea smithiana</i>	2,730.0	<0.0%	1,460.0	<0.0%	17,520.0
14 Pakistan poplar	291,960.0	1.9%	407,014.0	4.8%	4,884,168.0
Total	15,260,133.7	100.0%	8,451,177.0	100.0%	101,383,499.9

Table 11: Timber product volumes by use in Kabul wood markets

Genus	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/ annual turnover rate	Estimated annual turnover rate (m ³)
Construction Total	17,362.0	33.6%	7,753.0	21.5%	93,023.4
Round Log	14,964.9	29.0%	6,525.8	18.1%	78,296.65
Sawn Lumber	2,397.1	4.6%	1,227.2	3.4%	14,726.75
Firewood	34,265.7	66.4%	28,308.6	78.5%	339,542.3
Total	51,627.7	100.0%	36,061.6	100.0%	432,565.9

Table 12: Timber product values by use in Kabul wood markets

Genus	Observed Stock Value (USD)	Percentage of Stock Total	Reported Monthly Turnover Rate (USD)	Percentage of Monthly/ Annual Turnover Rate	Estimated Annual Turnover Rate (USD)
Construction Total	12,816,655.3	84.0%	6,401,506.1	75.7%	76,800,313.0
Round Log	11,782,470.1	77.2%	5,902,647.8	69.8%	70,835,373.1
Sawn Lumber	1,034,185.2	6.8%	498,858.3	5.9%	5,964,939.8
Firewood	2,443,478.4	16.0%	2,049,670.9	24.3%	24,583,186.9
Total	15,260,133.7	100.0%	8,451,177.0	100.0%	101,383,499.9

Table 13: Timber product volumes per species for construction use in Kabul wood markets

Species	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/ annual turnover rate	Estimated annual turnover rate (m ³)
1 <i>Populus nigra</i>	11,509.9	66.3%	5,513.9	71.1%	66,167.1
2 <i>Populus ciliata</i>	1,886.6	10.9%	593.3	7.7%	7,120.1
3 <i>Populus alba</i>	300.0	1.7%	173.7	2.2%	2,084.9
4 <i>Quercus baloot</i>	0.5	<0.0%	<0.0	<0.0%	0.3
5 <i>Quercus dilatata</i>	0.0	0.0%	0.0	0.0%	0.0
6 <i>Pinus gerardiana</i>	133.9	0.8%	32.9	0.4%	395.1
7 <i>Pinus wallichiana</i>	226.2	1.3%	67.8	0.9%	813.1
8 <i>Juniperus excelsa</i>	67.0	0.4%	68.0	0.9%	816.0
9 <i>Larix sibirica</i>	1,594.0	9.2%	981.3	12.7%	11,775.5
10 <i>Abies webbiana</i> var. <i>pindrow</i>	100.1	0.6%	48.0	0.6%	576.4
11 <i>Salix wallichiana</i>	57.9	0.3%	24.1	0.3%	289.2
12 <i>Cedrus deodara</i>	252.3	1.5%	83.2	1.1%	998.1
13 <i>Picea smithiana</i>	12.0	0.1%	2.7	<0.0%	32.9
14 Pakistan poplar	1,221.5	7.0%	164.0	2.1%	1,967.9
Total	17,362.0	100.0%	7,753.0	100.0%	93,036.6

Table 14: Timber product volumes per species for firewood use in Kabul wood markets

Species	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/ annual turnover rate	Estimated annual turnover rate (m ³)
1 <i>Populus nigra</i>	105.8	0.3%	2.4	<0.0%	28.4
2 <i>Populus ciliata</i>	0.0	0.0%	0.0	0.0%	0.0
3 <i>Populus alba</i>	6.2	<0.0%	1.2	<0.0%	14.9
4 <i>Quercus baloot</i>	12,237.8	35.7%	11,033.4	39.0%	132,400.6
5 <i>Quercus dilatata</i>	6,055.1	17.7%	5,130.2	18.1%	61,562.4
6 <i>Pinus gerardiana</i>	17.4	0.1%	6.7	<0.0%	80.6
7 <i>Pinus wallichiana</i>	0.0	0.0%	0.0	0.0%	0.0
8 <i>Juniperus excelsa</i>	15,841.0	46.2%	12,133.5	42.9%	145,601.7
9 <i>Larix sibirica</i>	0.0	0.0%	0.0	0.0%	0.0
10 <i>Abies webbiana</i> var. <i>pindrow</i>	0.0	0.0%	0.0	0.0%	0.0
11 <i>Salix wallichiana</i>	2.5	<0.0%	1.2	<0.0%	14.9
12 <i>Cedrus deodara</i>	0.0	0.0%	0.0	0.0%	0.0
13 <i>Picea smithiana</i>	0.0	0.0%	0.0	0.0%	0.0
14 Pakistan poplar	0.0	0.0%	0.0	0.0%	0.0
Total	34,265.7	100.0%	28,308.6	100.0%	339,703.5

Table 15: Timber product values per species for construction use in Kabul wood markets

Species	Observed Stock Value (USD)	Percentage of Stock Total	Reported Monthly Turnover Rate (USD)	Percentage of Monthly/ Annual Turnover Rate	Estimated Annual Turnover Rate (USD)
1 <i>Populus nigra</i>	10,635,416.9	83.0%	4,021,665.0	62.8%	48,259,980.4
2 <i>Populus ciliata</i>	780,822.0	6.1%	867,568.2	13.6%	10,410,819.0
3 <i>Populus alba</i>	26,270.0	0.2%	44,103.6	0.7%	529,243.2
4 <i>Quercus baloot</i>	75.0	<0.0%	60.0	<0.0%	720.0
5 <i>Quercus dilatata</i>	0.0	0.0%	0.0	0.0%	0.0
6 <i>Pinus gerardiana</i>	18,599.0	0.1%	76,700.0	1.2%	920,400.0
7 <i>Pinus wallichiana</i>	65,216.2	0.5%	374,395.4	5.8%	4,492,744.8
8 <i>Juniperus excelsa</i>	82,012.0	0.6%	42,241.0	0.7%	506,892.0
9 <i>Larix sibirica</i>	636,314.2	5.0%	366,368.8	5.7%	4,396,425.6
10 <i>Abies webbiana</i> var. <i>pindrow</i>	25,632.0	0.2%	89,180.0	1.4%	1,070,160.0
11 <i>Salix wallichiana</i>	7,408.0	0.1%	5,880.0	0.1%	70,560.0
12 <i>Cedrus deodara</i>	244,200.0	1.9%	104,870.0	1.6%	1,258,440.0
13 <i>Picea smithiana</i>	2,730.0	0.0%	1,460.0	0.0%	17,520.0
14 Pakistan poplar	291,960.0	2.3%	407,014.0	6.4%	4,884,168.0
Total	12,816,655.3	100.0%	6,401,506.1	100.0%	76,818,073.0

Table 16: Timber product values per species for firewood use in Kabul wood markets

Species	Observed Stock Value (USD)	Percentage of Stock Total	Reported Monthly Turnover Rate (USD)	Percentage of Monthly/ Annual Turnover Rate	Estimated Annual Turnover Rate (USD)
1 <i>Populus nigra</i>	4,260.0	0.2%	102.0	<0.0%	1,224.0
2 <i>Populus ciliata</i>	0.0	0.0%	0.0	0.0%	0.0
3 <i>Populus alba</i>	300.0	<0.0%	60.0	<0.0%	720.0
4 <i>Quercus baloot</i>	1,095,998.8	44.9%	969,496.2	47.3%	11,633,954.7
5 <i>Quercus dilatata</i>	540,970.0	22.1%	459,251.0	22.4%	5,511,012.3
6 <i>Pinus gerardiana</i>	728.0	<0.0%	312.0	<0.0%	3,744.0
7 <i>Pinus wallichiana</i>	0.0	0.0%	0.0	0.0%	0.0
8 <i>Juniperus excelsa</i>	801,133.6	32.8%	620,405.7	30.3%	7,444,867.9
9 <i>Larix sibirica</i>	0.0	0.0%	0.0	0.0%	0.0
10 <i>Abies webbiana</i> var.	0.0	0.0%	0.0	0.0%	0.0

Species	Observed Stock Value (USD)	Percentage of Stock Total	Reported Monthly Turnover Rate (USD)	Percentage of Monthly/ Annual Turnover Rate	Estimated Annual Turnover Rate (USD)
<i>pindrow</i>					
11 <i>Salix wallichiana</i>	88.0	<0.0%	44.0	<0.0%	528.0
12 <i>Cedrus deodara</i>	0.0	0.0%	0.0	0.0%	0.0
13 <i>Picea smithiana</i>	0.0	0.0%	0.0	0.0%	0.0
14 Pakistan poplar	0.0	0.0%	0.0	0.0%	0.0
Total	2,443,478.4	100.0%	2,049,670.9	100.0%	24,596,050.9

Table 17: Regional sources for all species in Kabul wood markets

Region	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/ annual turnover rate	Estimated annual turnover rate (m ³)
1 Paktiya	20,336.4	39.4%	17,281.4	47.9%	207,376.8
2 Khost	13,245.5	25.7%	10,484.7	29.1%	125,816.3
3 Ghazni	5,368.1	10.4%	3,042.0	8.4%	36,503.9
4 Bamyan	3,606.6	7.0%	1,362.2	3.8%	16,346.4
5 Russia	1,590.8	3.1%	975.6	2.7%	11,707.1
6 Wardak	2,575.4	5.0%	935.9	2.6%	11,230.2
7 Pakistan	2,478.0	4.8%	660.9	1.8%	7,930.7
8 Paktika	794.7	1.5%	599.3	1.7%	7,191.9
9 Logar	710.5	1.4%	447.8	1.2%	5,373.5
10 Parwan	480.3	0.9%	98.0	0.3%	1,176.1
11 Kunar	150.1	0.3%	76.5	0.2%	918.0
12 Kabul	87.1	0.2%	42.5	0.1%	509.8
13 Balkh	27.2	0.1%	17.4	<0.0%	208.5
14 Uruzgan	7.9	<0.0%	11.5	<0.0%	138.2
15 Daikondy	1.8	<0.0%	6.1	<0.0%	72.7
16 Kunduz	1.0	<0.0%	2.9	<0.0%	35.1
17 Uzbekistan	13.2	<0.0%	1.0	<0.0%	11.7
18 Baghlan	1.3	<0.0%	0.8	<0.0%	9.1
19 Sari Pul	14.5	<0.0%	0.7	<0.0%	7.8
20 <i>Unknown Afghan Province</i>	87.7	0.2%	14.7	<0.0%	176.3
Total	51,627.7	100.0%	36,061.7	100.0%	432,740.1

Table 18: Regional sources for *Cedrus deodara* in Kabul wood markets

Region	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/ annual turnover rate	Estimated annual turnover rate (m ³)
1 Kunar	141.8	56.2%	49.5	59.5%	594.0
2 Paktiya	21.2	8.4%	30.0	36.1%	360.1
3 Pakistan	51.1	20.2%	2.4	2.9%	28.6
4 Khost	38.2	15.1%	1.3	1.5%	15.3
Total	252.3	100.0%	83.2	100.0%	998.1

Table 19: Regional sources for *Quercus dilatata* in Kabul wood markets

Region	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/ annual turnover rate	Estimated annual turnover rate (m ³)
1 Khost	3,309.2	54.7%	2,819.0	54.9%	33,827.6
2 Paktiya	2,696.6	44.5%	2,279.9	44.4%	27,358.5
3 Paktika	30.6	0.5%	17.2	0.3%	206.1
4 Wardak	11.2	0.2%	11.2	0.2%	134.4

5 Ghazni	7.5	0.1%	3.0	0.1%	35.8
Total	6,055.1	100.0%	5,130.2	100.0%	61,562.4

Table 20: Regional sources for *Quercus baloot* in Kabul wood markets

Region	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/annual turnover rate	Estimated annual turnover rate (m ³)
1 Paktiya	8,003.6	65.4%	7,260.5	65.8%	87,126.0
2 Khost	3,671.7	30.0%	3,328.3	30.2%	39,939.2
3 Paktika	526.4	4.3%	406.6	3.7%	4,878.7
4 Pakistan	35.1	0.3%	34.3	0.3%	412.2
5 Ghazni	1.5	<0.0%	3.7	<0.0%	44.8
Total	12,238.3	100.0%	11,033.4	100.0%	132,400.9

Table 21: Regional sources for *Juniperus excelsa* in Kabul wood markets

Region	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/annual turnover rate	Estimated annual turnover rate (m ³)
1 Paktiya	9,449.2	59.4%	7,618.2	62.4%	91,418.6
2 Khost	6,091.6	38.3%	4,308.6	35.3%	51,703.5
3 Paktika	237.7	1.5%	175.6	1.4%	2,107.1
4 Pakistan	88.4	0.6%	51.6	0.4%	619.7
5 Kunar	6.9	<0.0%	25.0	0.2%	300.0
6 Wardak	27.4	0.2%	11.2	0.1%	134.4
7 Logar	1.9	<0.0%	3.7	<0.0%	44.8
8 Ghazni	2.5	<0.0%	3.7	<0.0%	44.8
9 Kabul	2.5	<0.0%	3.7	<0.0%	44.8
Total	15,907.9	100.0%	12,201.5	100.0%	146,417.7

Table 22: Regional sources for *Populus nigra* in Kabul wood markets

Region	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/annual turnover rate	Estimated annual turnover rate (m ³)
1 Ghazni	4,742.3	40.8%	2,892.8	52.4%	34,713.9
2 Bamyan	3,071.3	26.4%	1,222.6	22.2%	1,671.6
3 Wardak	2,096.6	18.0%	641.0	11.6%	7,692.1
4 Logar	552.9	4.8%	329.1	6.0%	3,949.8
5 Pakistan	731.2	6.3%	255.2	4.6%	3,062.3
6 Parwan	239.7	2.1%	65.7	1.2%	788.6
7 Kabul	76.3	0.7%	37.0	0.7%	444.4
8 Paktiya	59.3	0.5%	28.5	0.5%	342.4
9 Balkh	21.5	0.2%	16.0	0.3%	192.6
10 Uruzgan	7.9	0.1%	11.5	0.2%	138.2
11 Daikondy	1.8	0.0%	6.1	0.1%	72.7
12 Khost	9.1	0.1%	5.3	0.1%	63.9
13 Kunduz	1.0	<0.0%	2.9	0.1%	35.1
14 Baghlan	1.3	<0.0%	0.8	<0.0%	9.1
15 Russia	1.0	<0.0%	0.3	<0.0%	3.9
Unknown Afghan Province	2.4	<0.0%	1.3	<0.0%	15.1
Total	11,615.7	100.0%	5,516.3	100.0%	66,195.4

Table 23: Regional sources for *Populus ciliata* in Kabul wood markets

Region	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/annual turnover rate	Estimated annual turnover rate (m ³)
1 Wardak	368.5	19.5%	163.8	27.6%	1,966.1
2 Ghazni	540.8	28.7%	121.2	20.4%	1,454.2
3 Bamyān	423.1	22.4%	117.8	19.9%	1,414.1
4 Logar	133.6	7.1%	106.9	18.0%	1,282.9
5 Pakistan	151.2	8.0%	48.5	8.2%	582.2
6 Parwan	239.8	12.7%	31.9	5.4%	383.4
7 Russia	9.5	0.5%	1.3	0.2%	16.2
8 Paktiya	2.0	0.1%	0.7	0.1%	8.4
9 Sari Pul	14.5	0.8%	0.7	0.1%	7.8
10 Balkh	3.2	0.2%	0.3	0.1%	3.7
11 Kabul	0.2	<0.0%	0.0	<0.0%	0.1
12 Unknown Afghan Province	0.3	<0.0%	0.1	<0.0%	1.2
Total	1,886.6	100.0%	593.3	100.0%	7,120.1

Table 24: Regional sources for *Populus alba* in Kabul wood markets

Region	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/annual turnover rate	Estimated annual turnover rate (m ³)
1 Wardak	57.4	18.7%	104.4	59.6%	1,252.2
2 Pakistan	56.0	18.3%	40.0	22.9%	480.0
3 Bamyān	86.1	28.1%	11.8	6.7%	141.7
4 Logar	12.3	4.0%	3.4	2.0%	41.3
5 Paktiya	6.2	2.0%	1.2	0.7%	14.9
6 Russia	2.4	0.8%	0.4	0.2%	5.0
7 Kabul	0.8	0.3%	0.4	0.2%	4.7
8 Unknown Afghan Province	85.0	27.7%	13.3	7.6%	160.0
Total	306.2	100.0%	175.0	100.0%	2,099.8

Table 25: Regional sources for *Larix sibirica* in Kabul wood markets

Region	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/annual turnover rate	Estimated annual turnover rate (m ³)
1 Russia	1,577.9	99.0%	973.5	99.2%	11,682.0
2 Bamyān	13.5	0.8%	7.8	0.8%	93.4
3 Paktiya	2.6	0.2%	<0.0	<0.0%	0.1
Total	1,594.0	100.0%	981.3	100.0%	11,775.5

Table 26: Regional sources for *Salix wallichiana* in Kabul wood markets

Region	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/annual turnover rate	Estimated annual turnover rate (m ³)
1 Ghazni	31.9	52.9%	16.0	63.2%	192.3
2 Logar	9.8	16.2%	4.6	18.0%	54.9
3 Wardak	10.7	17.8%	3.1	12.4%	37.7
4 Kabul	7.3	12.1%	1.3	5.2%	15.8
5 Bamyān	0.6	0.9%	0.3	1.1%	3.4
Total	60.4	100.0%	25.3	100.0%	304.2

Table 27: Regional sources for *Abies webbiana* var. *pindrow* in Kabul wood markets

Region	Observed Stock Volume (m ³)	Percentage of Stock Total	Reported Monthly Turnover Rate (m ³)	Percentage of Monthly/ Annual Turnover Rate	Estimated Annual Turnover Rate (m ³)
1 Paktiya	27.8	27.7%	37.5	78.1%	449.9
2 Pakistan	43.8	43.7%	6.8	14.2%	82.1
3 Khost	28.5	28.5%	3.7	7.7%	44.4
Total	100.1	100.0%	48.0	100.0%	576.4

Table 28: Regional sources for *Pinus gerardiana* in Kabul wood markets

Region	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/ annual turnover rate	Estimated annual turnover rate (m ³)
1 Pakistan	93.0	61.5%	17.8	44.9%	213.6
2 Paktiya	41.7	27.6%	16.0	40.3%	191.7
3 Khost	16.6	11.0%	5.9	14.8%	70.4
Total	151.3	100.0%	39.6	100.0%	475.7

Table 29: Regional sources for *Pinus wallichiana* in Kabul wood markets

Region	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/ annual turnover rate	Estimated annual turnover rate (m ³)
1 Pakistan	129.3	57.2%	46.1	68.1%	553.5
2 Khost	68.9	30.5%	10.0	14.7%	119.6
3 Paktiya	25.7	11.4%	8.8	13.0%	105.7
4 Kunar	1.4	0.6%	2.0	3.0%	24.0
5 Ghazni	0.9	0.4%	0.9	1.3%	10.3
Total	226.2	100.0%	67.8	100.0%	813.1

Table 30: Regional sources for *Picea smithiana* in Kabul wood markets

Region	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/ annual turnover rate	Estimated annual turnover rate (m ³)
1 Khost	11.6	95.9%	2.7	98.2%	32.3
2 Paktiya	0.5	4.1%	<0.0	1.8%	0.6
Total	12.0	100.0%	2.7	100.0%	32.9

Table 31: Regional sources for Pakistan poplar in Kabul wood markets

Region	Observed stock volume (m ³)	Percentage of stock total	Reported monthly turnover rate (m ³)	Percentage of monthly/ annual turnover rate	Estimated annual turnover rate (m ³)
1 Pakistan	1,148.6	94.0%	158.0	96.4%	1,896.6
2 Bamyan	12.0	1.0%	1.8	1.1%	22.1
3 Wardak	3.5	0.3%	1.1	0.7%	13.3
4 Balkh	2.5	0.2%	1.0	0.6%	12.2
5 Uzbekistan	13.2	1.1%	1.0	0.6%	11.7
6 Ghazni	40.8	3.3%	0.7	0.4%	7.8
7 Parwan	0.9	0.1%	0.3	0.2%	4.1
Total	1,221.5	100.0%	164.0	100.0%	1,967.9



Truck loaded with Deodar cedar from the Kunar province, eastern Afghanistan. This wood was reportedly headed for sale at a timber market in Dubai. No cedar was visible at any of the markets surveyed in Kabul. The research team did not conduct timber trade surveys in the eastern provinces due to the continually worsening security. February 2007. Photo: WCS, Gul Wali and Deen Mohammad.