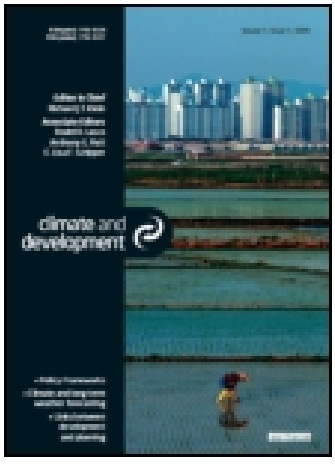

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climate and development

RESEARCH ARTICLE

Property rights and climate change vulnerability in Turkish forest communities: a case study from Seyhan River Basin, Turkey

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Turkey is expected to experience significant climate change, including increased temperatures and desertification. As these changes affect forestry, agriculture and animal husbandry, they threaten the livelihoods of forest communities across the country. In addition, other, institutional factors such as the property regime can act in tandem with physical stressors to increase communities' overall vulnerability to climate change. This article focuses on how the current structure of Turkish forest property rights, in determining access to forest resources that communities depend on for building resilience in marginal environments, influences communities' adaption strategies and shapes their vulnerability to climate change. Through an analysis of how forest communities in the Seyhan River Basin gain access to state-owned forest resources, this article shows that without secure access to these resources, forest communities in the Basin are made more vulnerable to the impacts of climate change.

Keywords: climate change; vulnerability; adaptation; property rights; access to resources; Turkey; forest communities

Introduction

The First National Communication of Turkey on Climate Change predicts significant changes in key climatic parameters for all regions of Turkey (Ministry of Environment and Forestry, 2007). The main hazards – drought, flooding and forest fires – are expected to increase in both severity and frequency with climate change, affecting economic sectors such as forestry, agriculture, animal husbandry, industry, and tourism (United Nations Development Programme, UNDP, 2009c). These changes could be potentially catastrophic to the livelihoods, health and well-being of forest communities. Outside of physical vulnerability to these changes, institutions such as the property regime can act to put communities in an even more precarious situation. There is currently a lack of critical analysis on the determinants of vulnerability within Turkish forest communities and how the structure of property rights in forests areas may interact with and influence communities' vulnerability to expected climatic changes through, for example, determining access to forest resources that forest communities depend on for building resilience in marginal environments.

This article first provides an overview of the framework for understanding climate change vulnerability and property rights, and then applies this framework to a case study in the Seyhan River Basin (SRB) of Turkey. The shape and direction of climate change for the region are explored, leading into a description of livelihood diversification as a traditional adaptation strategy for coping with environmental change. The article then focuses on how the property regime influences communities' adaption strategies and shapes their vulnerability to climate change. It concludes with an examination of how adaptation can be enhanced, followed by avenues for further research.

Framework for understanding climate change vulnerability and property rights

The framework of climate change vulnerability has evolved from research in natural hazards, food security, and human ecology (Ford & Smit, 2004; Kelly & Adger, 2000; Smithers & Smit, 1997; Turner et al., 2003). The Intergovernmental Panel on Climate Change (IPCC) defines vulnerability as 'the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes' (2007, p. 6). One of the key determinants of a system's vulnerability is its adaptive capacity, or its ability to respond to climate variability and change (IPCC, 2007). The concept of adaptive capacity shows that vulnerability to climate stress is not merely a function of physical exposure, but also social, cultural, economic, technical, political, and institutional conditions that affect an individual's or community's potential to address its exposure-sensitivity (Berkes & Folke, 1994; Bohle, Downing, & Watts, 1994;

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Ford & Smit, 2004; Ford, Smit, & Wandel, 2006; IPCC, 2007; Jones & Boyd, 2011; O'Brien et al., 2004; Tol, Klein, & Nicholls, 2008). From such an understanding, adaptation measures – or steps taken to decrease a system's vulnerability – need not take the form of 'hard' engineered efforts, but can also include 'soft' measures involving changes in institutions, behaviours, policies or education.

Institutions can be conceived of as 'sets of enforceable rules that facilitate and constrain human action' (Agrawal, 2003, p. 244). The property regime is one institution that can influence a system's adaptive capacity, and thus its vulnerability, because it sets the rules regarding access to resources that might be necessary for responding to climate change. Property can be best understood not as an object or resource, but rather as an enforceable or legitimate right to use or benefit from that resource in relation to other people (MacPherson, 1978). Disputes or complications often arise in forested land around defining both 'legitimate' and 'resource'. Different individuals or groups of individuals will have different perceptions of what gives them a 'legitimate right' to the land, which may be based on statutory law or some form of local or native customary law, and which may not always align with each other (Amanor, 2008; Doolittle, 2007; Leach, Mearns, & Scoones, 1999; Peluso, 1995). Clashes over usufruct rights can also occur with defining the resource to be used; in forested land, this may be the timber products, non-timber forest products (NTFPs), animals, carbon, the entire ecosystem and its services, or the land or territory itself.

Property regimes consist of the multiple ways that people understand and communicate with each other on their rights to resources. It is one of the many variables of a system that can directly affect its vulnerability to climate change through determining access to critical resources for adaptation. Rural communities, especially in developing countries or those on marginal lands, rely directly on ecosystem resources – food, water, medicine and shelter – for the necessities of their survival. Because of their dependence on natural resources, these communities are highly vulnerable to changes in climate (Bohle et al., 1994).

If the impacts of climate change cannot be mitigated rapidly enough, addressing the adaptive capacity of people is one area that can be enhanced to reduce vulnerability to these changes. A clear understanding of how property regimes affect a system's vulnerability could then provide a starting point for adaptation measures that focus on securing sustainable access to critical natural resources necessary for buffering the negative impacts of climate change. The following case study presents an analysis of the current property regime in forest communities in the SRB in southeast Turkey and how it shapes and influences community vulnerability to already observable climate change.

Seyhan River Basin case study

Seyhan River Basin livelihoods

SRB covers an approximate area of 20,731 km^2 in Turkey's southeastern Mediterranean region (see Figure 1). In the four districts represented in this study – Aladağ, Kozan, Feke, and Saimbeyli – the main economic activities are agriculture, animal husbandry, forestry, services, and industry (UNDP 2009b). According to the UNDP's draft version of the Livelihoods Baseline Analysis (UNDP, 2009b), agriculture and animal husbandry together represent between 70–90% of employment in these four districts. These figures include unpaid employment by family members, as is often the case with women.

In the mountainous areas of SRB, where this case study is centred, agriculture and animal husbandry is done at a small scale, with low productivity compared with industrial-scale operations in the rich river delta below. Agriculture is usually subsistence while animal husbandry involves a mix of household consumption and a handful of sales a year. For the purposes of this article, an important distinction lies in the type of animal husbandry, as they are dependent on different resources. Cattle, sheep, and chickens are fed from the harvest of wheat or barley fields. As they are fed on harvested resources, they are kept in pens or left free to roam near the homes. Adult goats, however, require leafy material, weeds, or brush to feed on, and so villagers have historically taken them to the forests surrounding the village to browse. Forestry work, paid labour, sale of NTFPs, and payments from the state form also an important part of villagers' livelihood strategies in addition to agriculture and animal husbandry.

SRB is a mountainous area populated with several species of trees, including red pine, black pine, cedar, and Taurus fir, with a total forest area of roughly 547,739 ha or 27% of SRB (Figure 2) (UNDP, 2009b). These forests are under the management of the Adana Regional Directorate of Forestry (ARDF), but, like nearly all forests in Turkey, are owned by the state General Directorate of Forestry, a part of the Ministry of Forestry and Water Affairs (formerly Ministry of Environment and Forestry) (General Directorate of Forestry, 2009). According to the Turkish Constitution and other laws, this means that all forest resources are under the control of the state, even where citizens have historically inhabited a forest (The Constitution of the Republic of Turkey, Articles 169–170, 1982; 6831 Sayılı Orman Kanunu [SOK], Madde 6 [Forest Law No. 6831, Article 6], 1956, *amended by* Law No. 3373, 1987).[1] When forestry work is needed, the Regional Directorate gives priority to local forest villagers for these jobs in accordance with the law (6831 SOK, m. 40, 1956). The forestry sector provides several jobs for villagers, through cutting, sowing, planting, guarding protected areas, and harvesting NTFPs. According to ARDF, forest villagers are one of the poorest groups in

Figure 1. Map of the location and the borders of the Seyhan River Basin in Turkey (UNDP, 2009a).

Turkish society, and providing these jobs forms a social function of the state forests in improving their livelihoods through additional income sources (ARDF, 2010).

Climate change in the Seyhan River Basin

SRB, along with other parts of Turkey, is projected to experience drastic changes to its climate in the coming years. According to the First National Communication of Turkey on Climate Change, SRB is a particularly vulnerable region in terms of climate change (Millennium Development Goals Achievement Fund, MDG-F, 2008). Downscaling projections from Meteorological Research Institute (MRI) and Center for Climate Systems Research (CCSR) General Circulation Models (GCMs) based on SRES A2 scenario predict a 2–2.7°C rise in annual average temperatures by the 2070s (Fujihara et al., 2008), though it is important to note that downscaled projections do have a high level of uncertainty when applied at fine scales. These GCMs also suggest an annual decrease in precipitation of 157–182 mm, representing a 25–29% decrease from the current situation (Fujihara et al., 2008). These precipitation projections, along with a projected 24.7–27.4% decrease in groundwater recharge and a 118–139 mm decrease in annual river flow (a 52–61% decrease), suggest that available water resources will be severely threatened by climate change (Fujihara et al., 2008; Tezcan et al., 2007). Decreasing precipitation, together with a growing population, is expected to put the region under extreme water stress

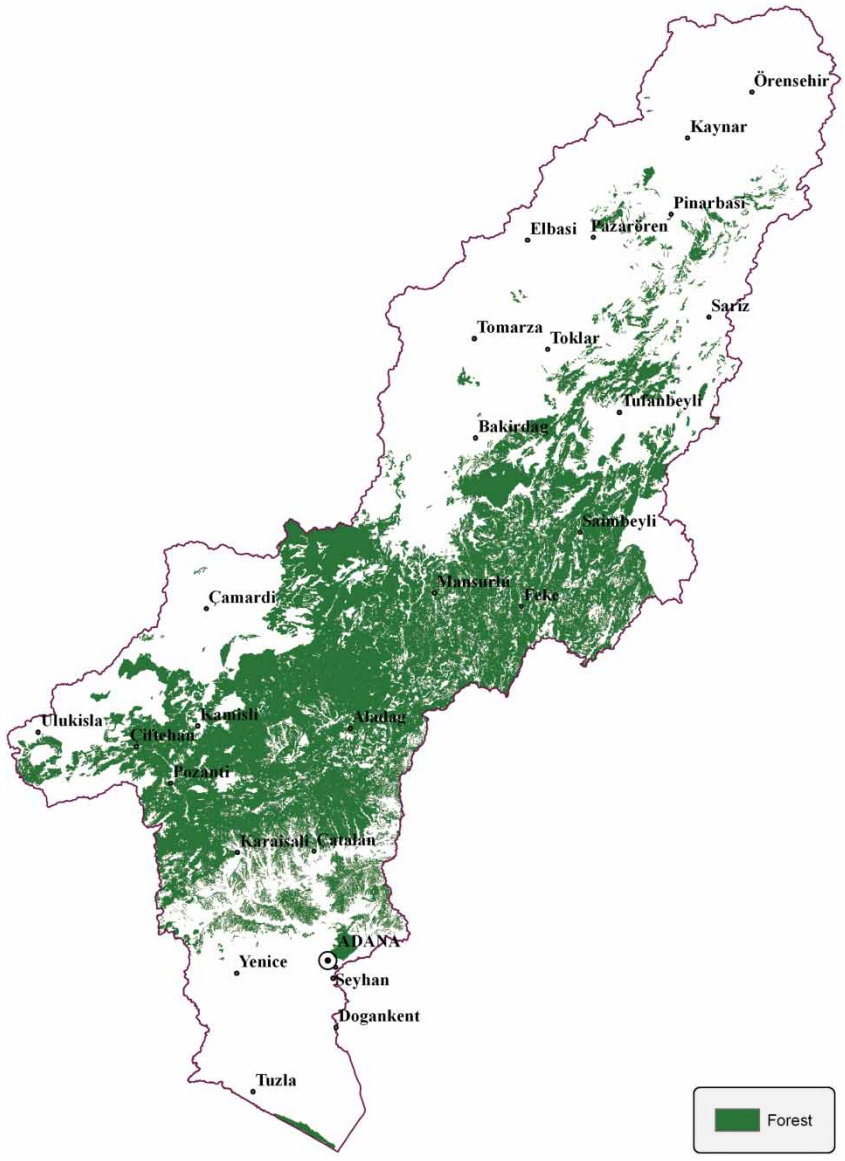

Figure 2. Map of the location and extent of forested area in the Seyhan River Basin.
Source: Turak, A., email to author, June 18, 2012.

(Schröter et al., 2005; Watanabe, 2008). This will have serious impacts on the region's agricultural sector, as well as the rich diversity of species including several endemic and threatened species in the basin (FAO, 2010; MDG-F, 2008).

Climate change is also expected to seriously impact forests, especially the high forests of the Taurus Mountains in SRB that are adapted to cooler climates and cannot migrate upward as temperatures rise (FAO, 2010). While in theory lower forest ecosystems are predicted to expand upslope, a lack of connecting corridors, landowner issues, and livelihood practices may prevent upward expansion, leading to a loss of forest cover, biodiversity and ecosystem services (Zeydanlı & Ülgen, 2009). Climatic changes are generally projected to decrease the habitat suitability of SRB's main forest types (Table 1). As aridity and temperature increase, forest fires are expected to increase in frequency and severity, lowering carbon sequestration and altering forest composition upon re-colonization (FAO, 2010; Zeydanlı & Ülgen, 2009). Severe mortality in oak, pine, and fir forests has already been reported in response to droughts in central Turkey (FAO, 2010). Climate change is also expected to impact forests through increasing hospitable habitats for debilitating pests and diseases (Zeydanlı & Ülgen, 2009). Such changes in forest health and composition seriously threaten the livelihoods of those who depend on them for food, resources, and employment.

Table 1. Projected changes in habitat suitability for four main forest types by 2050 in the Seyhan River Basin (Zeydanlı et al. 2010).

	% of stands where habitat suitability is decreasing	% of stands where habitat suitability is increasing	% of stands where habitat suitability shows no change
Red pine	56.2	1.2	42.6
Black pine	68.5	9.6	21.9
Taurus fir	93.1	0.1	6.8
Cedar	85.7	0.5	13.8

In response to the growing concern over climate change, the UNDP initiated a project in late 2007 to help Turkey adapt to expected climatic changes. With $7 million in funding secured from the MDG-F, 'Enhancing the Capacity of Turkey to Adapt to Climate Change' sought to integrate climate change adaptation into national, regional and local policies and improve Turkey's institutional capacity to 'manage climate change risks that threaten Turkey's rural and coastal area development' (MDG-F, 2008). For one part of the project, community-based pilot projects to adapt to climate change in SRB were implemented between 2008 and 2010. The UNDP chose 18 pilot projects out of roughly 150 submissions from various NGOs, government agencies, universities and community groups. ARDF, working in conjunction with the Ankara-based Nature Conservation Centre, gained approval of its project entitled *Adaptation of Forest Ecosystems and Forestry to Climate Change in Seyhan Basin: Ecosystem Services (Social), Biodiversity (Environmental) and Forest Products (Economic)*. This project aimed to assess the main impacts of climate change and risks to forests and their ecosystems in SRB, evaluate which communities or social groups are most likely to be affected, and propose various methods for adaptation of forest management and forest communities to climate change. The research for this article forms one part of the ARDF pilot project, and presents data on the impacts of climate change on forest communities in SRB and an analysis of the effects of the current property rights regime on the adaptive capacity and vulnerability of these communities.

Methods

A total of 66 semi-structured and unstructured interviews with forest villagers and ARDF officials were conducted in July 2010 in a total of nine forest villages, spread throughout the Aladağ, Kozan, Feke, and Saimbeyli districts: Kıcak, Çukurköy, Kapıkaya, Akkaya, Marangeçili, Değirmenuşağı, Kayadibi, Halilbeyli, and Çürükler. On average, seven interviews were conducted per village. To provide context, the expansive region contains a total rural population of 606,285, and 115,289 households in the villages (UNDP, 2009b). In the four districts covered in the fieldwork, the rural population is 93,551 with 17,862 households in the villages (UNDP, 2009b).

Data collection was undertaken with the help of two Turkish translators, used one at a time. With the exception of one village, interviews began with the *muhtar* ('mayor') of each village to gain information on general livelihood strategies of the village, as well as current and past climatic trends. From there, a snowball sampling method of interviewing was used as the main strategy, although opportunistic sampling was at times also used. Both individual as well as group interviews were utilized; group interviews included single family, multiple family and non-family groups. Each group interview is counted as a single interview, though for discussions on policy perceptions, individual opinions were then counted separately within a group. Specific emphasis was placed on diversity in terms of gender, age and livelihood strategies of interview subjects. Interviewees were asked open-ended questions about their perceptions on climate change in their village, their livelihood strategy (including resource use), or both. A sample of questions used during semi-structured interviews is provided in the Annex. Specific findings were then teased from interview data using qualitative grouping assigned after fieldwork. Opinions and perceptions were assigned after analyzing responses from villagers within the context of the full interview discussion, and not through structured questionnaires. Resources and income sources were tallied and placed into categories defined after data collection. These categories were chosen after an analysis of the data as broadly representative of the great diversity of responses.

Interviews with villagers were complemented with observation of community natural resource use and interaction with forestry officials whenever possible. Secondary sources such as ARDF reports, UNDP reports, data from the Nature Conservation Centre, relevant laws, and journal articles were analysed to complement information gleaned through interviews, and provide context on the region's vulnerability to climate change.

Perceived changes in climate

According to forest villagers, climate change has already been manifesting itself in SRB in multiple ways. Through a total of 51 interviews on the topic, current climate change trends were assessed, and the responses are presented in Table 2. This table shows the number of

Table 2. Perceived climatic changes.

Climatic parameter	N[a]	Decrease (%)	Increase (%)	Seasonal/ diurnal change (%)	No change (%)	Do not know (%)
Change in snowfall	46	91[b]	0	0	2	7
Change in temperature	43	2	58	5	26	9
Change in aridity	42	5	74	0	17	5
Change in rainfall	39	38	15	8	26	13
Change in climate variability	11	0	82	0	18	0
Shifting seasons	11	0	Total: 91 Later: 64 Earlier: 9 Unspecified: 18	0	9	0
Change in flood regime	9	44	33	0	22	0
Change in fog	4	0	75	0	25	0

[a]The total number of people commenting varies among the climatic parameters. 36 out of the 51 respondents were specifically asked for their perceptions on change in snowfall, temperature, aridity and rainfall, so there will always be a minimum of 36 responses for these categories, though others volunteering observations add to the volume. If a respondent did not mention a change, it was not assumed she meant 'no change' was observed; it is simply not counted.
[b]Percentages may not add up to 100% due to rounding.

respondents mentioning a change in some environmental variable, such as temperature, and the direction of this change (either positive or negative). It does not present the degree or severity of the change. Sometimes the direction of the change was clear across the villages, as with snowfall patterns, but sometimes the direction of change was less clear, as with rainfall. Of key concern are the climatic variables that have a majority of respondents mentioning a trend or direction of change. These trends, highlighted in the table, include decreasing snowfall, increasing temperature, increasing aridity, shifting seasons and increasing variability of climate. The noted increase in fog is omitted from this list due to the low number of commentators on the subject.

These perceived trends reflect data gathered over the past few decades in the southern region of Turkey. From the around the 1930s until the mid-to-late 1990s, data from climatological stations in the SRB area show that annual average temperature minimums have generally increased (Türkeş & Sümer, 2004; Türkeş, Sümer, & Demir, 2002), although data for average maximums from the Adana station in SRB show no change or insignificant change (Kadıoğlu, 1997; Türkeş & Sümer, 2004), with the linear regression remaining flat around 25°C (Türkeş & Sümer, 2004). In their article on temperature trends in Turkey, Türkeş et al. (2002) found significant warming trends in annual mean temperatures from three of nine climatological stations in the Mediterranean region, which includes the SRB, though the authors note the most significant trends are from highly urbanized areas. These three stations showed an annual mean temperature increase of ~0.11–0.19°C per decade, while the other six stations in the region showed insignificant increases or decreases. Five stations showed statistically significant increases in annual temperature minimums at the rate of 0.11–0.56°C per decade. Annual long-term precipitation trends for the southern Mediterranean region also show a significant decrease – the most significant of all the regions in the country – indicating increased drying and desertification of the area (Türkeş, Koç, & Sariş, 2009).

Villagers asserted that increasing temperatures, decreased snowfall and increased aridity have all contributed to lower garden, orchard and grain field productivity. Increasing climate variability, also a prominent trend cited by villagers, is creating unpredictable agricultural seasons, making the villagers' traditional knowledge of harvest times less useful, and leading to a loss of crops and income. Below are two selected quotations from interviews with older village men who describe how specific climatic changes have led to lower agricultural productivity:

> A man in the village, he planted in September and got half. Others planted in November and were fine. Everything changed, starting 15 years ago. Back then, it got cold in September already, so you planted then. Now it doesn't get cold until the end of December, so you have to plant later. –G.Ş.[2]
>
> Aridity has increased. . .Nothing stays anymore [when you plant it]. When I was a kid, the mountains had everything; now it's all drying. – U.K.

Despite the small scale of most agricultural activities, when crops are not as abundant as expected, villagers have less excess product to sell and lose their supplemental income sources. More importantly, they also lose a large source of their diet and animal feed, so must also purchase more produce, wheat flour, animal feed, and fertilizers, putting further strain on their limited incomes. Inhabitants of the village Marangeçili also commented that the higher temperatures, along with other climatic phenomena, have increased a fungus called *zenk* to the grape and sweet cherry trees, which many in the village rely on for their main source of income.

These changes in climate are also starting to affect the number of mushrooms in the basin, which nearly a third of all families interviewed sold and nearly two-thirds utilized as a subsistence food. As these mushrooms are highly valued, some families are almost able to support themselves from mushroom collection alone. However, they rely on a specific amount and timing of rainfall that may be changing, thus threatening another key income source in addition to garden, orchard and field products.

These environmental changes noted by villagers – increasing aridity, increasing fungal disease, and decreasing edible mushroom growth – may be due in part to factors other than climate change. However, a lack of research and published data from the region makes it difficult to understand the complete picture of underlying determinants of environmental change in the basin.

Traditional adaptation to a variable environment: livelihood diversification

All of the observed climatic changes noted above have an impact on forest villagers in terms of livelihood security and overall well-being. However, SRB is a stress-prone region and villagers have developed many traditional ways of adapting to the variable and marginal environment, including temporary or permanent migration, water harvesting techniques, reliance on social capital and networks for support, and risk spreading through livelihood diversification. This article focuses on livelihood diversification as a form of adaptive capacity due to its long history in the region and its centrality in villagers' livelihood strategies.

Livelihood diversification constitutes a part of how villagers in SRB cope with environmental variability in general, and is not a new trend in response to observed climate change. However, as the climate is beginning to change, it also buffers the negative impacts of those changes. Livelihood diversification works through risk spreading of potential loss; if one livelihood source is depleted, others exist as a safety so that overall health and well-being can be maintained. Risk from climate change is then shared among the livelihoods sources, providing more security that at least a partial income or access to resources is maintained for coping with problems (Adger, 1999; Ford et al., 2006; Kelly & Adger, 2000; Turner et al., 2003).

Many of the villagers expressed an ability and willingness to work anywhere; such flexibility is one form of adaptive capacity in that it allows for a diversity of income sources to be exploited. Figure 3 presents these data on income source diversity among the 35 households interviewed on the topic. Out of eight income source categories defined after data collection, the average number of income sources per household was 2.9. However, the majority of these income categories are actually groupings of smaller income sources (e.g. animal husbandry includes cows, sheep, and goats), and if further divided up, then several families will have an even higher number of income sources and thus diversity.

Half of these income sources and nearly half of household income rely either fully or partially on forest health and access to forest resources. In the majority of families, there is at least one person who consistently takes part in forestry work when it is offered. Cutting, cleaning, guarding and administrative jobs often provide a main source of income for families. Other forest jobs such as planting and sowing only provide a source of supplementary income. Forests also enable another form of income generation, animal husbandry, through providing browsing space for goats. Animal husbandry has represented a significant livelihood source for many villagers during crisis years where drought or other climatic factors impacted their other livelihood sources, because livestock can be sold for additional income to purchase food and supplies to get them through the crisis. One man interviewed provided an anecdote of such a situation, which is emblematic of a larger reliance on a diversity of livelihood sources as an adaptation strategy:

> One man had 6.5 *dönüm* [6,500 m^2] of wheat, and with the bad harvest, he lost so much he had to sell his cow to buy next year's fertilizer. – H.H.

Table 3 presents another way of looking at income diversity and the relative importance of specific income sources. It presents the number of households engaging in a specific income activity as well as the conditional probabilities of these income activities, which shows us how likely a family utilizing one income source also utilizes another. For example, of families that engage in local forestry, 63% are also engaged in some form of animal husbandry, though this does not exclude them from also tapping other income sources. Because these categories do not have the same number of people engaged in them, this means that the reverse situation does not always the same probability; 65% of families engaged in animal husbandry also engage in forestry. Demand and prices are high enough for mushrooms that sales can sometimes constitute a family's primary source of income, which is why it is separated from other NTFPs in Table 3.

Income forms only one part of how forest villagers secure a livelihood; subsistence food is also gathered from a diversity of sources, the average being 2.9 (Figure 4). The forest provides them with sources of food, water, and medicine for subsistence. Cedar mushrooms were the only NTFPs that formed a significant part of their caloric intake, which is why they are separated out from other NTFPs in Figure 3. But other NTFPs such as thyme, sumac, and St. John's wort were still widely used as culturally significant spices, teas or traditional medicines. Many of these NTFPs are not found in the forest *per se*, but rather in more open or rocky areas within forest boundaries. The forest also provides a small number of families who hunt

Table 3. Conditional probabilities of the eight broad income categories[a].

	N	Local forestry (%)	Animal husbandry (%)	Paid labor (%)	Mushroom sales (%)	Payments from state (%)	NTFP sales (%)	Garden/ orchard (%)	Remittances (%)
Local forestry	24		63	38	46	17	29	17	0
Animal husbandry	23	65		44	30	22	30	26	4
Paid labor[b]	15	69	77		31	0	15	23	0
Mushroom sales	11	100	64	36		9	18	36	0
Payments from state[c]	10	53	11	0	10		10	0	10
NTFP sales	9	70	70	20	20	10		20	0
Garden/orchard	6	67	100	50	67	0	33		0
Remittances	1	0	100	0	0	100	0	0	

[a]Total number of households is 35.
[b]'Paid labor' includes forestry labor in regions outside of where the family lives. However, it mostly consists of work done in local mines and dams.
[c]'Payments from state' is defined as 'retirement money' (social security), 'elderly money' (for those over 65 years of age) and any subsidies paid by the government.

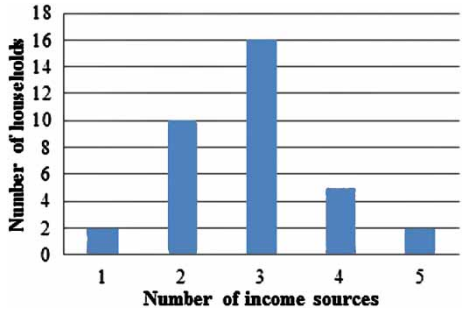

Figure 3. Income diversity of households by number of sources.

with game to eat. The majority of subsistence food (57%), however, comes not from the forest, but from household agriculture and animal husbandry.

The data provided above illustrate how a diversity of income and subsistence food sources form a critical part of forest villagers' ability to respond to environmental stress and variability. If climate change threatens to place further stress on one livelihood source, as it already is with agriculture, then villagers still have others they can rely on. However, many of these sources depend on secure access to forests and forest resources. As forests are property of the state, the government retains the power to dictate access to these goods. The next section will examine the Turkish forest property regime and how it influences and shapes forest villagers' vulnerability to changes in climate that are already underway.

Forest property rights, access to resources, and vulnerability

The structure of statutory forest property rights in Turkey takes a fairly centralized form with complete ownership by the state, but with actual management of the forests being devolved to regional directorates, such as ARDF. According to Article 169 of the Turkish Constitution, all forests and forest products are legally property of the state; however, Forest Law 6831 amended this Article to allow for two additional categories: forests belonging to public legal entities and private forests (6831 SOK, m. 4, 1956). Still, 99.9% of forests in Turkey are owned by the state (General Directorate of Forestry, 2009), and all forests, regardless of the owner, are subject to the control of the General Directorate of Forestry (6831 SOK, m. 6, 1956, *amended by* Law No. 3373, 1987). According to the law, gathering natural resources of any kind from the forests, even for household consumption, is forbidden (6831 SOK, m. 14, 1956). According to interviews with ARDF officials, extractions can be made from the forest but require a fee to be paid to the Directorate of Forestry. Cutting trees without the required fee is punishable with one month to a year in prison and several thousand liras in fines, depending on whether the cut was for timber or woodfuel (6831 SOK, m. 91, 1956, *amended by* Law No. 2896, 1983).

The statutory property regime represents the legitimate ownership of resources, but forms only one way in which people can access resources (Langridge, Christian-Smith, & Lohse, 2006; Leach et al., 1999; Ribot & Peluso, 2003). Understanding how forest villagers in SRB *access* resources provides us with a different picture of resource use from what an analysis of pure statutory law would provide. Statutory regulation of certain forest resources, such as woodfuel, is largely uncontested by forest villagers in SRB, who pay the subsidized amount of 10 TL (roughly US$6.33) per year and are satisfied with the amount they are allowed to cut. However, accessing NTFPs for household consumption or small-scale sales is often not done according to the letter of the law, meaning villagers collect NTFPs without paying the required fee to ARDF. This collection is often done to the knowledge of ARDF forest guards, who simply look the other way on these small-scale extractions for items that are not as valuable as timber and whose illegal extraction is not as visible.

Ultimately, the state retains the statutory, and thus enforceable, right to manage forest resources, which can include exclusion. Because it maintains this right, villagers are made vulnerable to the state's actions (Leach & Mearns, 1996; Singer, 2000). As explained above, while many villagers do currently maintain access in some form to a variety of forest resources, this access is at times illegal and punishable under the law. A critical question then is what happens in terms of community vulnerability to climate change if the state decides to enforce the laws? Or, more drastically, what if the state decides to alter the laws to exclude villagers from forest resources? To answer these questions, an example of a relatively recent policy is analysed where villagers were excluded in certain ways from the forests that surround them.

Roughly 10 years ago, depending on the village, ARDF began a forest rehabilitation programme that involved fencing off forests, especially around villages. This was done in order to promote forest health, prevent erosion, and sequester carbon for climate change mitigation (personal communication with an ARDF official, July 19, 2010). As a result of the fencing policy, villagers were forbidden from entering the forest with their animals. As goats are the only animal that requires forest browsing, villagers were forced to sell their goats and abandon that livelihood strategy.

The topic of the fencing policy came up 33 times during interviews – exactly half – though opinions of the policy varied. As some group interviews featured dissenting views among the members, a total of 38 *opinions* on the policy were actually gathered. Figure 5 presents data on these opinions, but in order to get a clearer understanding of how the policy is perceived by those who were actually affected by it, the opinions of ARDF officials were teased out of the data, leaving 35 villager perceptions.[3] Villagers often clearly articulated their stance on the policy, but when they did not outright state whether they agreed or disagreed with the policy, those citing benefits were categorized as having a positive view; those citing detriments were categorized as having a negative view; and those citing both were categorized as ambivalent. The majority of villagers felt negatively about the fencing policy, but a significant minority expressed an ambivalent perception

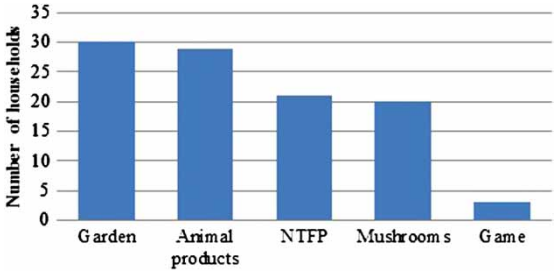

Figure 4. Household diversity of subsistence food sources.

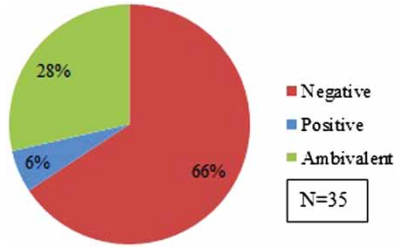

Figure 5. Villager perceptions on ARDF forest fencing policy.

where they understood both the benefits and costs, and were sympathetic to both forestry and village goals. Only a small minority of two people felt positive about the fencing policy, citing its benefits for forest health (Figure 5).

Data on villager perceptions of the policy were crossed with livelihood data to gain a deeper understanding of the types of households opposing, supporting or feeling ambivalent toward the topic. Of the 35 villager opinions, livelihood data gathered from interviews are only available for 21 villagers. It is interesting to note that of the individuals who felt negatively about the policy, 60% gained their income in part from forestry, compared with 100% of those who were ambivalent about it and who cited both benefits to the forest and economic costs to villagers. Eight-six percent of negative viewers also gained part of their income or livelihood from animal husbandry, compared with only 66% of those who felt ambivalent about the policy. This suggests the livelihood strategy of the household may have an impact on people's views of the policy, though the mechanism by which it impacts views cannot ultimately be determined from these data alone. Perhaps those working in forestry are more closely and frequently able to view changes in forest health, while those working with goats are confronted more by the costs. Or perhaps those working in forestry have more to gain from the fencing policy; building and monitoring fences provides jobs, as does trimming healthy forests.

While villagers who also owned cows and sheep were usually able to keep them as these animals do not rely on forest browse, goats nonetheless represented a large part of their income, a form of insurance against climate-related agricultural loss, as well as a culturally significant symbol. Furthermore, with a decreased number of livestock, villagers had fewer assets to sell during drought or other climate-stressed years to buy food and supplies necessary for their survival. Below are a couple of quotations from interviews that express the general importance of goats in villagers' lives:

> We had 300 goats but sold them because of the fencing, because there was no more area for them. . .If animal husbandry ends, the village ends. – G.Ş.
>
> I had sheep and goats and I sold their meat and milk and got money. I was important; they would call me *Ağa* ['landowner' or 'respected person']. But then the forestry

> directorate started fencing the forests for protection and I couldn't graze my animals. I had to sell them. Now they call me *Çakal* ['jackal']. – A.Ç.

More importantly, villagers lost another income and subsistence food source which decreases their livelihood diversity, and in turn, their ability to cope with climatic changes. As climate change currently threatens forest villagers' livelihood sources from various forms of agriculture and NTFPs, the ARDF forest rehabilitation project also cut off an additional livelihood source – goat husbandry. Lost access to resources creates a vulnerability that may coincide with and exacerbate their vulnerability to climate change. O'Brien et al. (2004) describe this overlap of vulnerabilities to climate change and other stressors as 'double exposure', and stress the importance of understanding multiple factors in assessing overall vulnerability. In this case, forest villagers in SRB are exposed to stressors from both climate change impacts and insecure access to resources as dictated through the property regime.

Spaces for adaptation

The ARDF rehabilitation project represents one incidence of how the structure of the forest property regime has restricted villagers' access to resources, increasing their vulnerability to climate change. Yet the current property regime can work in other ways to decrease access to resources as well; in two of the villages visited during research, Çukurköy and Kayadibi, inhabitants were in legal battles with the state over titles to land. Through aerial pictures, some taken decades ago, ARDF defined forest boundaries and thus the limits of forest villagers' rights. Even if villagers' homes fell within this boundary and they had been living there for generations, ARDF still claimed it as state land. These legal battles are weighing heavily on the villagers, who instead of losing one or two livelihood sources, may be losing their homes and entire way of life.

It is important to ask how community vulnerability will be impacted upon if exclusionary policies such as these continue or expand. While Article 170 of the Constitution mandates cooperation between the state and forest villagers, including even the 'exploitation of forests for the purpose of…improving the living conditions of their inhabitants', interviews did not indicate that the state has ever recognized inalienable local rights to forest resources or management in SRB; in fact, Article 169 mandates that all forests are ultimately under state control. This does not necessarily mean local rights have not been granted elsewhere in the country, but a lack of published evidence makes it difficult to provide cases of such recognition. By the very fact that statutory property rights can be enforced and made exclusionary at any time, villagers' resilience to climate change remains precarious because they do not have full, participatory rights to the land or its resources. Lack of secure access to forest lands and key resources, unclear tenure arrangements, and built-in inequities within the institutionalized property regime represent significant social barriers to adaptation to climate change (Jones & Boyd, 2011), as well as sustainable forest management that meets the objectives of multiple stakeholders (FAO, 2010).

One space for adaptation, then, involves institutional change regarding property rights to ensure more secure access for villagers to forest resources. This does not necessarily translate to a transfer of full property rights to forest villagers, as the problems surrounding the equity and effectiveness of titling abound in a variety of contexts (Peters, 2009; Shipton & Goheen, 1992). Rights to resources can encompass a variety of actions beyond the right to sell (also referred to as the right of alienation), such as the right to withdraw, manage, exclude and use (Agrawal & Ostrom, 2001). While the General Directorate of Forestry may feel that leaving forest management in the hands of villagers may lead to further degradation of forests, secure land tenure in the minimum form of rights to manage and exclude has been shown to improve sustainable management of natural resources (Agrawal & Ostrom, 2001). A variety of combinations of rights could be experimented with, with the goal of finding a regime that guarantees both secure access to critical resources for village resilience as well as healthy, economically viable forests that the Directorate of Forestry relies upon. The concept of sustainable access and planned management is critical as well, as short-term access may lead to mismanagement of forest resources and maladaptation. In finding a balance between sustainable access and economically viable forests, it is imperative that property rights remain flexible; the uncertainties surrounding climate change coupled with the dynamism of communities means that the form of vulnerabilities can alter rapidly, and institutions need to be able to adapt at pace in order to maintain effectiveness in the long term.

The majority of current adaptation strategies employed by forest villagers, such as livelihood diversification, form an autonomous way of coping with climatic changes. But as villagers' resilience is so intimately tied in with state policy and institutions, that there may be a limit to how effective such autonomous strategies may be without working together with the state. Cooperative, strategic planning and development may be able to help villagers cope with ongoing climate change to a greater degree because it addresses multiple stressors and, due to its long-term lens, encourages sustainability.

Forests in this region are complex social-ecological systems that neither the villagers nor Directorate officials are likely to have a full understanding of how best to manage it for multiple needs; full understanding requires communication and partnership (Robinson & Berkes, 2011). There is room for both forest villagers and the state to benefit from working together on sustainable,

planned adaptation in forested areas. Villagers could benefit from state technical support in areas such as monitoring and research of forests and climate change. They could also benefit from a greater voice in forest management. Often, the most vulnerable groups to climate change become that way in part due to their exclusion from decisions in the management of natural resources upon which they depend or of climate-related risks (Adger, 2003, 2006). Increasing the transparency in forest management and including forest villagers to a greater degree in forest management deliberations would build adaptive capacity and benefit the villagers (Robinson & Berkes, 2011), as there is currently little room for them to formally define their values and objectives in forest management (Baskent, Köse, & Keles, 2003; Baskent, Terzioğlu, & Başkaya, 2008; Ozturk, Gucel, Kucuk, & Sakcali, 2010, despite the fact that Article 170 of the Constitution mandates cooperation.

ARDF could benefit as well from a more inclusive dialogue with forest villagers. Many villagers in fact have a deep understanding of forest ecosystems, which can be of great benefit to forest management plans. Their distinct knowledge that stems from living on the land can complement ARDF's more technical knowledge to create sustainable, adaptive resource management (Berkes & Folke, 1994; Tol et al., 2008). This knowledge can be especially useful for the Directorate in the coming years, as climate change impacts, biodiversity and ecological criteria are being phased into previously pure economic-based forest management plans (FAO, 2010; General Directorate of Forestry, 2009; personal communication with an ARDF official, July 19, 2010).

Lastly, it is important to consider the myriad agents influencing forest policy beyond ARDF and forest villagers, as their dynamics and power relations can have a great effect on adaptation strategies. For example, ARDF has to respond not only to forest villagers, but timber merchants, timber cooperatives, the central Directorate of Forestry and local politicians as well, each with its own agenda that it will exert pressure on ARDF to see through. A more detailed discussion on inter-agent relations and the political economy of forest policy is beyond the scope of this article; however, it would be an important part of further research to shed light on spaces for adaptation.

Conclusion

As climatic changes such as increased drought and climate variability begin to threaten the livelihoods of forest communities in Turkey, adaptation and increased adaptive capacity will become necessary to ensure their continued health and well-being. Adaptation does not always have to take the form of 'hard' technology or engineered approaches. Institutional change in the property regime is one example of a 'soft' adaptation measure that could increase villagers' adaptive capacity to climate change. While traditionally villagers in SRB have adapted to a marginal and variable environment through livelihood diversification and risk-spreading, many of these livelihood sources may be negatively impacted by climate change. Securing villagers' rights to forest resources would protect against further losses of livelihood sources, maintaining this risk-spreading mechanism and enhancing their adaptive capacity. A flexible, creative property system that secures access for villagers to forest resources as well as seeks to achieve the goals of the General Directorate of Forestry is needed, and could be possible through inclusive discussion and transparent management.

Detailed research on forests communities' vulnerabilities to climate change is significantly lacking in Turkey. The country would certainly benefit from continued and extended research on the subject of climate change vulnerability, as many gaps exist in understanding its determinants as well as how climate stressors may overlap with other stressors, exacerbating vulnerability. This article is meant to provide a starting point for further discussion and research on the subject in the context of Turkey's forest areas, especially around how institutional, political and social structures may influence vulnerability. As it only focuses on the property regime, it by no means represents a complete understanding or analysis of forest communities' vulnerability to climate change. Further research into how the property regime or other structural factors interact with and influence climate change vulnerability can provide several more spaces for enhancing these communities' ability to adapt to the increasing climatic changes they are already observing.

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Notes

1. This paper is based on the English translation of Forest Law 6831, which can be found through a search of the FAO Legal Office database. Retrieved April 14, 2011, from http://faolex.fao.org.

2. Full names are withheld throughout this paper to protect the confidentiality of interview subjects.
3. The three ARDF officials who commented on the policy all perceived it positively.

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Annex: Sample interview questions for villagers

The following interview questions were used as a broad template for interviewing villagers in the Seyhan River Basin about their daily lives, livelihood strategy, and perceptions of climate change. They were meant to encourage further discussion and not necessarily, to have every interviewee answer every question.

Many villagers had never even heard of climate change and, when asked about climatic changes, would often begin to speak of changes in the last year or so and not on longer time scales. Because of this, questions had to be altered to reflect their experiences. Questions regarding changes over a certain number of years (e.g. over the past 50 years) were avoided because most could not keep track of the years in such a way; rather, interviewees were asked of changes over their lifetime or since they were a child—a timeframe they could relate to. This does lead to variability in the timeframe of perceived climatic changes, as interviewees were of all ages. Questions regarding specific measurements, such as changes in degrees Celsius, were also unhelpful, as respondents generally do not or cannot keep track of such measurements. Later on, it was found helpful to probe perceived changes in specific climatic parameters of snowfall, temperature, aridity and rainfall.

1. Who is in your family?
2. What does each family member do?
   a. If a paid job, how much is earned?
   b. How often and what time of year does he/she partake in this employment?
3. Do you have a garden or a field?
   a. What do you grow?
   b. How much?
   c. For what reason?
4. What forest products do you use?
   a. How much?
   b. For what reason?
   c. When do you collect them?
   d. How do you collect them?
5. What changes in climate have you perceived over your lifetime?
   a. What changes in snowfall have you perceived?
   b. What changes in temperature have you perceived?
   c. What changes in aridity have you perceived?
   d. What changes in rainfall have you perceived?
6. What changes in forest resources have you experienced over your lifetime?
7. How have you been coping with these changes in climate or resources?