Correlates of Deforestation in Turkey: Evidence from High-Resolution Satellite Data

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Abstract

During the last decade, environmental issues have gained saliency in Turkish politics, especially after the Gezi Park demonstrations. However, no systemic empirical evidence exists to inform us about the relationship between politics and deforestation in Turkey. This paper brings together all possible drivers of deforestation–political, economic, and climatic factors–from Turkey and merges it with high-resolution satellite data on deforestation to do a systemic empirical analysis. The results show that districts with Justice and Development Party (AKP) mayors have higher deforestation by around a combined area of 42 football pitches on average in a given district. Similarly, increased mining activities and newly built dams positively correlate with deforestation.

1 Introduction

Environmental issues are increasingly becoming one of the most contentious topics for Turkish politics over the last decade. These issues have gained saliency, especially after the Gezi Park demonstrations, which had started to defend the last green area in Taksim, İstanbul. Despite this increased attention, no systemic empirical evidence exists to inform us about the correlates of deforestation. In the absence of empirical evidence, while environmental resistance movements blame the government for destroying forests for infrastructural and energy projects and mining activities, the government and the president Erdoğan deny the allegations. On the contrary, Erdoğan even claimed that his government planted "4.5 billion trees" under his leadership.[1] As a result, we are unable to adjudicate between these different claims, despite the availability of high-resolution satellite data on forests.

Although we know that forests have been destroyed over the last decades in Turkey[2], no study has so far empirically investigated the impacts of both central and local governments' extractivist policies in various sectors such as mining, energy, and tourism. In the absence of any systemic empirical analyses, we do not know how much each factor contributes to deforestation in the country. That is why this paper studies the correlates of deforestation using high-resolution Landsat data. Deforestation in this context is defined as "as a stand-replacement disturbance or the complete removal of tree cover canopy at the Landsat pixel scale".[3]

This paper brings together all possible drivers of deforestation–political, economic, and climatic factors–from Turkey and conducts a systemic empirical analysis. Using high-resolution satellite data brings various advantages over administrative data on forest coverage. First, the General Directorate of Forestry does not release annual data on forests.[4] The directorate works on a forested area of around 2 million hectares each year, making it only possible to cover the whole country in 10 years. The latest data on forested areas in certain regions is 20 years old.[5] Therefore, it is not possible to use official data on forests to understand the drivers of deforestation since the data comes with a severe lag. Moreover, the released data is at the province level and does not allow fine-granular analysis at smaller geographical units. Third, data transparency and quality become serious issues, especially in democratically backsliding countries such as Turkey since information manipulation is the primary way to maintain legitimacy.[6]

[1] `https://bit.ly/2BjkJLW`

[2] See, for instance, `https://www.globalforestwatch.org/dashboards/country/TUR`

[3] Matthew C Hansen et al., "High-resolution global maps of 21st-century forest cover change," *Science* 342, no. 6160 (2013): 850.

[4] Türkiye Ormancılar Derneği, "Türkiye Ormancılığı," *Technical Report*, no. 47 (2019): 14.

[5] Ibid.

[6] Sergei Guriev and Daniel Treisman, "Informational autocrats," *Journal of Economic Perspectives* 33, no. 4 (2019): 100–127.

On the other hand, high-resolution satellite data allows us to track changes in forested areas at fine granular levels (30-meter resolution) annually. More importantly, data quality is not impacted by political considerations. Last, defining deforestation with respect to the Landsat pixel scale means that the measurement does not suffer from different definitions of forest,[7] making the data comparable across time and space.

By combining this satellite data with various data sources on possible drivers, I show that three factors consistently correlate with deforestation in Turkey: local AKP rule, new dams, and mining activities. Having a district (*ilçe*) whose municipalities are all governed by AKP mayor(s)[8] correlates with higher tree loss by around 42 football pitches in a given district for each election period. Similarly, a district has a higher tree loss by about 253 football pitches if the share of mining enterprises increases from none to 7%.[9] Building new dams is also correlated with higher tree loss: going from one new dam to seven new dams, which is the maximum observed in the sample, is positively associated with tree loss by around 120 football pitches in that district.

This paper makes several contributions. It provides the first empirical evidence on the correlates of deforestation in Turkey by paying specific attention to politics. Therefore, it contributes to the empirical political science and economics literature on deforestation.[10] It is also linked with scholarly works that analyze the impact of local governments on deforestation.[11] Second, it gives credence to the argument that local governments in Turkey are important actors despite their limited role in the design of environmental policies.[12] Last, quantifying the impacts allows us to compare the adverse impacts of various industries.

[7]For instance, the United Nations Framework Convention on Climate Change defines forests differently than the Food and Agriculture Organization. See: Doğanay Tolunay, "Dünyada ve Türkiye'de Ormansızlaşma," in *Ormancılık Politikaları ve Orman Köylülerinin Durumu*, ed. Onur Bilge Kula and Şükrü Durmuş (Cumhuriyet Halk Partisi Yayınları, 2017), 153–192

[8]Note that municipalities are nested within districts.

[9]Küre district in Kastamonu province has the maximum level of mining activity observed in the data, which is 7.2%.

[10]Sharon Pailler, "Re-election incentives and deforestation cycles in the Brazilian Amazon," *Journal of Environmental Economics and Management* 88 (2018): 345–365; Marco Elıas Cisneros Tersitsch, Krisztina Kis-Katos, and Nunung Nuryartono, *Palm oil and the politics of deforestation in Indonesia*, technical report (Ruhr Economic Papers, 2020); Robin Burgess et al., "The political economy of deforestation in the tropics," *The Quarterly Journal of Economics* 127, no. 4 (2012): 1707–1754; Luke Sanford, "Democratization, Elections, and Public Goods: The Evidence from Deforestation," *American Journal of Political Science*, 2021,

[11]Jesse C Ribot, Arun Agrawal, and Anne M Larson, "Recentralizing while decentralizing: how national governments reappropriate forest resources," *World development* 34, no. 11 (2006): 1864–1886; Maria Carmen Lemos and Arun Agrawal, "Environmental governance," *Annual review of environment and resources* 31 (2006); Cisneros Tersitsch, Kis-Katos, and Nuryartono, *Palm oil and the politics of deforestation in Indonesia*.

[12]Gökhan Orhan, "Yerel Yönetimler ve Kuresel İklim Değişikliği," in *Kuramdan Uygulamaya Yerel Yönetimler ve Kentsel Politikalar*, First Edition, ed. Yakup Bulut et al. (Pegem Akademi, 2013).

The structure of the paper is as follows. The following section focuses on the correlates of deforestation within the context of Turkey. The next section introduces the empirical strategy and explains the data sources and how variables are constructed. Section 4 presents the results, and section 5 concludes.

2 Correlates of deforestation

Since the foundation of the republic, the idea of development through rapid economic growth is not challenged by any political movement.[13] Despite differences in other dimensions (economic ideology and progressive/conservative values), political parties in Turkey have always supported developmental projects irrespective of their ideology.[14] However, the desire to grow economically at the expense of the environment has increased dramatically with the AKP governments,[15] both through the actions/policies of the central and local AKP governments. This became possible with the AKP's increasing authoritarianism since it makes it easier for central and local AKP governments to ignore environmental protection for economic growth and rent creation.

However, how rising authoritarianism can impact the environment is theoretically not clear. Although politics is recognized as an essential contributor to environmental issues in general and deforestation in particular, disagreement exists in how it affects. It is known that democracies provide more welfare to their citizens than non-democracies,[16] because democracy forces the leaders to heed the needs of the masses[17] and makes political leaders more responsive to the popular demands for environmental protection.[18] Therefore, it is theoretically plausible that deforestation should be more severe in authoritarian countries.

This logic indeed drives local and global environmental organizations to focus on decentralization and community-based forest management as an institutional reform to prevent tree loss.[19] By "democ-

[13]Murat Arsel, "Reflexive developmentalism? Toward an environmental critique of modernization," in *Environmentalism in Turkey*, ed. Fikret Adaman and Murat Arsel (Routledge, 2016), 29–48.

[14]Hande Paker et al., "Environmental organisations in Turkey: Engaging the state and capital," *Environmental Politics* 22, no. 5 (2013): 760–778; Ethemcan Turhan et al., "Beyond special circumstances: climate change policy in Turkey 1992–2015," *Wiley Interdisciplinary Reviews: Climate Change* 7, no. 3 (2016): 448–460.

[15]Bengi Akbulut and Fikret Adaman, "The unbearable charm of modernization: Growth fetishism and the making of state in Turkey," *Perspectives: Political Analysis and Commentary from Turkey* 5, no. 13 (2013): 1–10.

[16]Adam Przeworski et al., *Democracy and development: political institutions and well-being in the world, 1950-1990*, vol. 3 (Cambridge University Press, 2000).

[17]John Stuart Mill, *Considerations on Representative Government*, `https://www.gutenberg.org/files/5669/5669-h/5669-h.htm#link2HCH0003`, [Online; accessed 1-April-2019], 2004 [1861].

[18]Scott Barrett and Kathryn Graddy, "Freedom, growth, and the environment," *Environment and development economics*, 2000, 433–456; Y Hossein Farzin and Craig A Bond, "Democracy and environmental quality," *Journal of Development Economics* 81, no. 1 (2006): 213–235.

[19]Jacqueline M Klopp, "Deforestation and democratization: patronage, politics and forests in Kenya," *Journal of Eastern African Studies* 6, no. 2 (2012): 352.

ratizing" the environmental governance, decentralization aims to include locals, who are most likely to be affected by the destruction of forests, in decision-making processes.

However, others point that the relationship between democracy and the environment is not that clear[20] and that democratization and local governance do not guarantee the prevention of tree loss. On the contrary, patronage politics cause further tree loss, especially in settings with competitive elections. Forests can be used as resources for political purposes to satisfy the private interests in exchange for votes.[21] Re-election incentives make politicians more willing to sacrifice trees for votes,[22] creating "political logging cycles".[23] The recent evidence has shown that democratization can bring further deforestation, especially in weak democracies with highly competitive elections.[24]

Turkey's regime is best characterized as "competitive authoritarian".[25] In these regimes, elections are still competitive despite being unfair.[26] I argue that the competitive authoritarian nature of the regime provides a setting that is worse than both fully democratic and authoritarian regimes in terms of environmental protection. On the one hand, re-election pressures do not fade away in competitive authoritarian regimes, unlike the fully authoritarian regimes. The electoral pressures coming from competitive elections make the government ignore the environment since protecting it does not pay off electorally in the short run.

At the same time, horizontal institutions of accountability such as the independent judiciary or civil society cannot effectively check the government for environmental regulations, unlike fully consolidated democracies. Moreover, the public cannot effectively check the government's rent-seeking behaviors with the politically captured media. This absence of checks and balances, as a result, brings about greater flexibility for both central and local AKP governments to cater to private interests at the expense of the environment.

As a result, the central government pursues a similar developmentalist logic compared to previous governments, albeit with much increased pace and without any input from the public,[27] due to the nature of the competitive authoritarian regime. In such an institutional setting, local AKP governments,

[20] Meilanie Buitenzorgy and Arthur PJ Mol, "Does democracy lead to a better environment? Deforestation and the democratic transition peak," *Environmental and Resource Economics* 48, no. 1 (2011): 59–70.

[21] Klopp, "Deforestation and democratization: patronage, politics and forests in Kenya."

[22] Pailler, "Re-election incentives and deforestation cycles in the Brazilian Amazon"; Cisneros Tersitsch, Kis-Katos, and Nuryartono, *Palm oil and the politics of deforestation in Indonesia*.

[23] Burgess et al., "The political economy of deforestation in the tropics."

[24] Sanford, "Democratization, Elections, and Public Goods: The Evidence from Deforestation."

[25] Steven Levitsky and Lucan A Way, *Competitive Authoritarianism: Hybrid Regimes after the Cold War* (Cambridge University Press, 2010); Berk Esen and Sebnem Gumuscu, "Rising competitive authoritarianism in Turkey," *Third World Quarterly* 37, no. 9 (2016): 1581–1606.

[26] The government suffered a massive blow by losing Istanbul and Ankara in March 2019 local elections. This shows the competitive characteristics of the elections despite their unfairness.

[27] Begüm Özkaynak, Ethemcan Turhan, and Cem İskender Aydın, "The Politics of Energy in Turkey: Running Engines on Geopolitical, Discursive, and Coercive Power," in *The Oxford Handbook of Turkish Politics*, ed. Güneş Murat Tezcür (Oxford University Press, 2020).

in addition to the central government, gets more leeway to transfer forested lands to politically-connected business people for rent creation. Indeed, the evidence shows that private interests are more easily catered to over the last decade in Turkey.[28] As a result, "unprecedented extractivist drive"[29] in various sectors such as mining, energy, and construction became possible, which brought significant environmental problems, including deforestation.[30]

The energy sector is one of the primary sectors where we see the impacts of AKP's unprecedented modernist ambitions.[31] The AKP government started a series of legal changes that opened the electricity market to the private sector after they came to power.[32] The desire to reduce dependence on fossil fuels made hydroelectric power plants one of the favorite methods to produce electricity. As a result, the government aimed to construct dams in all major rivers by 2023, causing an immediate increase in the number of newly built small-scale hydroelectric power plants in the country.[33] The decision to dramatically expand the number of power plants was not taken with active public participation, and their impacts on the local ecosystems and communities have been ignored.[34] At the same time, however, the energy production capacity increased threefold.[35] Although these small-scale hydroelectric plants are believed to have minimal impact on the environment, their extensive utilization means that their environmental impacts are no different than large-scale dams.[36] Unsurprisingly, their adverse effects on the environment, including, but not limited to, tree loss, created opposition, especially from the local communities.[37]

[28] Esra Gürakar and Erik Meyersson, "State discretion, political connections and public procurement: Evidence from Turkey," *Unpublished manuscript. Retrieved from https://erikmeyersson. com/research*, 2016, Esra Çeviker Gürakar, *Politics of favoritism in public procurement in Turkey: Reconfigurations of dependency networks in the AKP era* (Springer, 2016).

[29] Fikret Adaman, Murat Arsel, and Bengi Akbulut, "Neoliberal developmentalism, authoritarian populism, and extractivism in the countryside: the Soma mining disaster in Turkey," *Critical Agrarian Studies*, 2018, 154.

[30] Fikret Adaman and Bengi Akbulut, "Erdoğan's three-pillared neoliberalism: Authoritarianism, populism and developmentalism," *Geoforum* 124 (2021): 279–289.

[31] Özkaynak, Turhan, and Aydın, "The Politics of Energy in Turkey: Running Engines on Geopolitical, Discursive, and Coercive Power."

[32] Ayşen Eren, "Transformation of the water-energy nexus in Turkey: re-imagining hydroelectricity infrastructure," *Energy research & social science* 41 (2018): 22–31.

[33] Ibid.

[34] Özkaynak, Turhan, and Aydın, "The Politics of Energy in Turkey: Running Engines on Geopolitical, Discursive, and Coercive Power."

[35] Sinan Erensü, "Powering neoliberalization: Energy and politics in the making of a new Turkey," *Energy research & social science* 41 (2018): 148–157.

[36] Tasneem Abbasi and SA Abbasi, "Small hydro and the environmental implications of its extensive utilization," *Renewable and sustainable energy reviews* 15, no. 4 (2011): 2134–2143; Mingyue Pang et al., "Ecological impacts of small hydropower in China: Insights from an emergy analysis of a case plant," *Energy policy* 76 (2015): 112–122.

[37] Ramazan Caner Sayan, "Exploring place-based approaches and energy justice: Ecology, social movements, and hydropower in Turkey," *Energy Research & Social Science* 57 (2019): 101234; Ramazan Caner Sayan and Aysegul Kibaroglu, "Understanding water-society nexus: insights from Turkey's small-scale hydropower policy," *Water Policy* 18, no. 5 (2016): 1286–1301.

Another critical sector that is dramatically impacted by the AKP's extractivist desire is mining. The government subcontracted mining operations to the private sector in many settings to increase production.[38] In addition to increasing environmental costs, this practice also brought about tragic incidents such as the Soma mining disaster.

By using remote sensing methods, some previous studies have already shown adverse environmental impacts of mining operations.[39] Even when such mining operations stop, abandoned open-pit mines continue to pollute the environment.[40] In Soma, for instance, where 31% of the domestic lignite production takes place, places around the mining areas witness water and air pollution, lower agricultural yield, and deforestation.[41]

Tourism is another critical industry affected by such extractivist desire due to its links with the construction sector. According to the World Tourism Barometer, Turkey is the sixth most visited country globally.[42] However, while Turkey's tourism policy aimed to increase the number of tourists, the environment has not been the priority, resulting in the conversion of significant forested lands into tourism-related facilities such as hotels.[43] Especially after wildfires, the possibility of turning burned forested areas into luxury holiday resorts and hotels has been one of the primary concerns in the opposition media.[44]

In addition to the central government's extractivist drive in mining, energy, and construction, the competitive authoritarianism also makes local AKP governments prioritize economic growth and rent creation at the expense of the environment. Although political patronage has always been a historical problem for Turkey,[45] the AKP government made it the basis of the competitive authoritarian regime in Turkey.[46] Local governments are not the primary actors in the design of environmental policies; however, they are important actors when it comes to the execution of these policies.[47] Moreover, local governments in Turkey play direct roles in preserving green areas in the urban spaces since they are responsible for taking care of them within their jurisdiction. Both the municipal law (*5993 Sayılı Belediye Kanunu*) and the metropolitan municipal law (*5216 sayılı Büyükşehir Belediye Kanunu*) make clear that local

[38] Adaman, Arsel, and Akbulut, "Neoliberal developmentalism, authoritarian populism, and extractivism in the countryside: the Soma mining disaster in Turkey."

[39] Murat Gül, Kemal Zorlu, and Muratcan Gül, "Assessment of mining impacts on environment in Muğla-Aydın (SW Turkey) using Landsat and Google Earth imagery," *Environmental monitoring and assessment* 191, no. 11 (2019): 1–18.

[40] Deniz Sanliyuksel Yucel and Alper Baba, "Geochemical characterization of acid mine lakes in northwest Turkey and their effect on the environment," *Archives of environmental contamination and toxicology* 64, no. 3 (2013): 357–376.

[41] Arife Karadag, "Changing environment and urban identity following open-cast mining and thermic power plant in Turkey: case of Soma," *Environmental monitoring and assessment* 184, no. 3 (2012): 1617–1632.

[42] World Tourism Organization., *UNWTO World Tourism Barometer*, vol. 18 (World Tourism Organization, 2020).

[43] Yalcin Kuvan, "Mass tourism development and deforestation in Turkey," *Anatolia* 21, no. 1 (2010): 155–168.

[44] `https://www.dw.com/tr/yanan-ormanlar-turizme-aç\T1\il\T1\ir-m\T1\i/a-58743611`

[45] Metin Heper and E Fuat Keyman, "Double-faced state: political patronage and the consolidation of democracy in Turkey," *Middle Eastern Studies* 34, no. 4 (1998): 259–277.

[46] Berk Esen and Sebnem Gumuscu, "Building a competitive authoritarian regime: State–business relations in the AKP's Turkey," *Journal of Balkan and Near Eastern Studies* 20, no. 4 (2018): 351.

[47] Orhan, "Yerel Yönetimler ve Kuresel İklim Değişikliği."

governments are responsible for green areas.[48] Moreover, local governments can directly affect tree cover within their boundaries due to their authority in city development plans. They can modify existing plans and create rents at the expense of the environment.

Last, some previous studies have argued that conflict between insurgent Kurdistan Workers Party (PKK) and the Turkish state forces can also increase deforestation.[49] These studies argue that state forces' deliberate attempts to limit the insurgents' capacity to wage war can also bring about deforestation. That is why I also analyze the impact of conflicts on deforestation in the analyses below.

In short, I expect that the AKP's government extractivist drive in mining, energy, and tourism sectors should significantly increase deforestation in the country. Moreover, in the absence of effective checks, local AKP governments should be more likely to pursue policies to cater to private interests that cause further environmental problems, including deforestation.

3 Empirical strategy and Data

Analyzing correlates of deforestation requires data collection from various sources. I rely on high-resolution spatial data to construct the dependent variable, *tree loss*, which comes from Hansen et al.[50] They use Landsat data to compile high-resolution global maps of tree cover change. The satellites use remote sensing technology to collect high-resolution reflectance characteristics of the ground. Each pixel reflects lights in a different way. For instance, water reflects lights differently than forests. Based on these reflectance characteristics, each pixel is classified.[51]

Since this data is high resolution (around 30 meters), I aggregated them at the district (*ilçe*) level. In particular, I calculated the percentage of tree loss of the total net land.[52] That is, for each district and year, I first counted the number of pixels–each is around 625 m^2–that witnessed tree loss.[53] Then, I divided this by the total number of pixels (the total net land) and multiplied by 100 to get the percentage of tree loss per year for each district. I use this variable, *Total % Tree Loss*, as my main dependent variable in the analysis.

To show the fine granularity of the data, I created an İstanbul map in which I highlighted pixels that witnessed tree loss in different periods. As we can see in Figure 1 below, the new airport's damage to

[48] Düriye Toprak, "Türkiye'nin çevre politikasında yerel yönetimlerin rolü: yerel yönetim bütçesinin incelenmesi," *Maliye Araştırmaları Dergisi* 3, no. 2 (2017).

[49] Jacob Van Etten et al., "Environmental destruction as a counterinsurgency strategy in the Kurdistan region of Turkey," *Geoforum* 39, no. 5 (2008): 1786–1797; Mehmet Gurses, "Environmental consequences of civil war: evidence from the Kurdish conflict in Turkey," *Civil Wars* 14, no. 2 (2012): 254–271.

[50] Hansen et al., "High-resolution global maps of 21st-century forest cover change."

[51] Louis R Iverson, Robin Lambert Graham, and Elizabeth A Cook, "Applications of satellite remote sensing to forested ecosystems," *Landscape ecology* 3, no. 2 (1989): 131–143.

[52] It is "net" since I excluded permanent water bodies such as rivers, lakes, reservoirs from the calculations.

[53] Although the resolution is 30 meters, this is the value you would get at the Equator. It gets smaller as one moves towards the poles, and the resolution is around 25 meters in Turkey.

tree coverage is immediately apparent. One can also visually track the damage caused by the newly built highway for the third bridge. I construct *Total % Tree Loss* by essentially tracking these pixels.

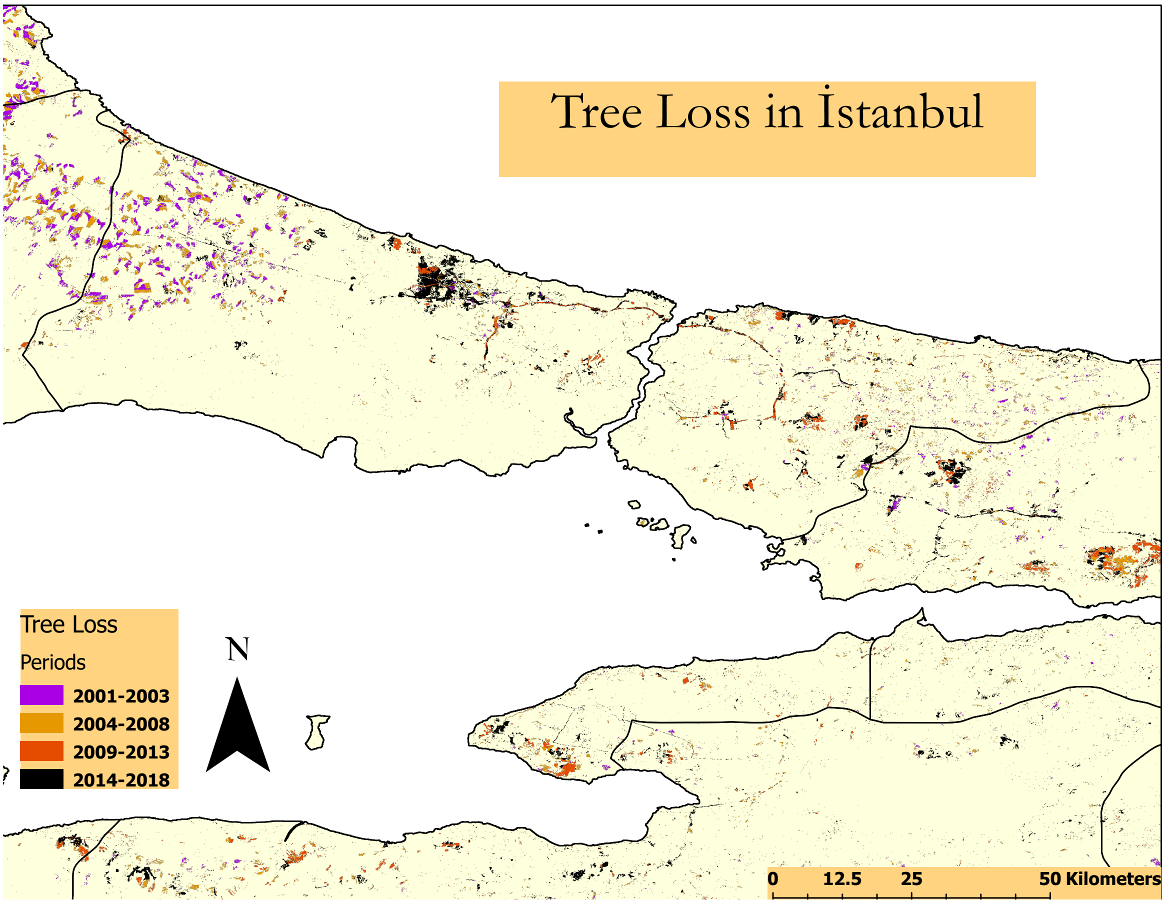

Figure 1: Tree loss in İstanbul and its surroundings in different time periods

Based on the discussion in the previous section, I identified various important variables that can correlate with deforestation. First, to identify local governments' impact on deforestation, I created a measure to proxy for the AKP's local rule intensity. For each election period, I identify the mayors' partisan affiliations. Since municipalities are nested within districts, I used a weighted ratio variable to measure the AKP local rule's intensity. In particular, I divided the number of voters that live under AKP municipalities by the total number of voters within each district. This weighted ratio variable takes into account differences in municipality sizes. For instance, in a district with two municipalities, if the AKP mayor is running a municipality twice as large as the non-AKP municipality, the AKP local rule variable will be $\frac{2}{3}$ in this weighted specification, as opposed to $\frac{1}{2}$. Although I use this weighted AKP local rule variable as my independent variable in the analyses below, I also show that the results are robust to different specifications. Also, note that each district has exactly one municipality in provinces with metropolitan status after the change in the Metropolitan Municipal Law in 2014.

To measure the impact of hydroelectric plants, I created an original dataset on the new dams built in the analyzed period. I used various sources such as the online energy atlas[54] and various government reports[55] to determine the date and the location of each new dam built. As a result, I managed to identify 502 hydropower plants built in the analyzed period (2004-2018). Since this is a count variable, I log-transformed it before using it in the analyses and created *No. of New Dams (log)* variable.[56]

For the mining sector, I use data from the Turkish Statistical Institute's Workplace survey, which was last conducted in 2002, and create the *Mining Share* variable, defined as the ratio of the number of workplaces in the mining sector over the total number of workplaces in a given district. Although this data is not up-to-date, it gives us a good baseline to account for differences across mining practices.

I use a dummy variable for the tourism sector that takes the value one if the district is on the Mediterranean or Aegean shores. To the extent that tourism affects deforestation adversely, we should see that these coastal districts lose more trees than the rest of the country.

I also use an extensive set of control variables that might correlate with deforestation. For instance, I use two variables to control general economic activities in districts. Previous studies have shown that population pressures and economic activities increase deforestation.[57] Therefore, we should expect higher tree loss in places that witness higher economic activity and population growth. The first one is *Nightlight Difference*, which captures changes in economic activity in a given district. The literature has shown that nightlights are a good proxy for economic activities, and many empirical studies employed nightlight data to proxy for economic growth in cases where official statistics do not exist or are not reliable.[58] Since the nightlight data series changed after 2013[59], I standardized the nightlight values within each period to make them comparable across different periods. Then, I calculated their difference, and I used this differenced variable in the regressions to proxy for economic growth. I also created the *Average Population Growth* variable since population growth can also cause increases in tree loss.

[54]`https://www.enerjiatlasi.com/hidroelektrik/`

[55]I used the application results published by the Energy Market Regulatory Authority each year as they support hydropower plants as part of the mechanism to support renewable energy sources.

[56]No. of New Dams (log) $= log($No. of New Dams $+1)$

[57]Helmut J Geist and Eric F Lambin, "Proximate Causes and Underlying Driving Forces of Tropical DeforestationTropical forests are disappearing as the result of many pressures, both local and regional, acting in various combinations in different geographical locations," *BioScience* 52, no. 2 (2002): 143–150; HB Günşen and E Atmiş, "Analysis of forest change and deforestation in Turkey," *International Forestry Review* 21, no. 2 (2019): 182–194; Tolunay, "Dünyada ve Türkiye'de Ormansızlaşma."

[58]J Vernon Henderson, Adam Storeygard, and David N Weil, "Measuring economic growth from outer space," *American economic review* 102, no. 2 (2012): 994–1028; Yingyao Hu and Jiaxiong Yao, *Illuminating economic growth* (International Monetary Fund, 2019); Ayşegül Düşündere Taşöz, "1992-2018 Dönemi için Gece Işıklarıyla İl Bazında GSYH Tahmini: 2018'de 81 İlin Büyüme Performansı," *Türkiye Ekonomi Politikaları Araştırma Vakfı*, 2019,

[59]National Centers for Environmental Information (NOAA) produced DMSP-OLS Nighttime Lights Time Series for the period between 1992-2013. After 2013, higher-quality data (VIRRS) was supplied by NASA and NOAA's Suomi National Polar Partnership (SNPP) satellite.

Since previous literature has also shown that conflict can also cause tree loss because of fires, I counted the number of conflicts that took place in Turkey between 2004 and 2018 using UCDP Georeferenced Event Dataset.[60] This dataset includes information about the location of conflicts worldwide. Using this location information, I counted the number of conflicts for each district in each period. I log-transformed this variable as well before using it in the analyses.[61]

I also control for climatic factors that can explain tree loss in certain regions in three ways. First, all the model specifications below include province dummies (province fixed effect). This makes sure that we are only comparing provinces within themselves, and we are not comparing across provinces. Hence, fixed-effect models ensure that we are not comparing Artvin with Yozgat. Province fixed effect also absorbs any uncontrolled time-invariant heterogeneity across provinces that could explain tree loss differences. Second, I use high-resolution temperature and precipitation data, which is available from 1960 at a monthly level for the whole world with around 20 km spatial resolution.[62] Using these monthly data, I constructed the average temperature range (maximum-minimum temperature in Celcius), and average precipitation (in mm) for every district. To further control for baseline differences in terms of tree coverage across districts, I also control for baseline green share in certain specifications.

Lastly, I control for fires using high-resolution firing data from NASA.[63] It records every fire captured by the satellites, and I counted the total number of fires within each district across years. Similar to other count variables, I also log-transformed this variable before using it in the analyses.

Using this data, I constructed a panel dataset for each district for three election periods: 2004-2008, 2009-2013, and 2014-2018. I aggregated at the election period level because mayors are the same within an election period. Therefore, my unit of analysis is the district-election period. The descriptive statistics are presented in Table 1 below.

[60] Ralph Sundberg and Erik Melander, "Introducing the UCDP georeferenced event dataset," *Journal of Peace Research* 50, no. 4 (2013): 523–532.

[61] No. of Conflicts (log) = log(No. of Conflicts +1)

[62] Stephen E Fick and Robert J Hijmans, "WorldClim 2: new 1-km spatial resolution climate surfaces for global land areas," *International Journal of Climatology* 37, no. 12 (2017): 4302–4315.

[63] The data is available here: `https://earthdata.nasa.gov/earth-observation-data/near-real-time/firms/active-fire-data`

	Mean	Median	SD	Min	Max
AKP	0.56	0.78	0.44	0.00	1.00
Ave. Pop Growth	0.43	0.10	6.66	-76.31	179.52
Nightlight Diff.	-0.02	-0.00	0.07	-0.74	0.22
Mining Share	0.00	0.00	0.01	0.00	0.07
No. of New Dams (log)	0.10	0.00	0.30	0.00	2.08
No. of conflicts (log)	0.12	0.00	0.44	0.00	3.99
Coastal District	0.07	0.00	0.26	0.00	1.00
Total No. of Fires (log)	2.28	2.08	1.81	0.00	8.40
Average Temp. Range	11.13	11.37	1.58	6.77	15.66
Average Precipitation	55.46	54.04	15.39	24.06	153.63
Baseline Green (share)	0.19	0.07	0.24	0.00	0.94

Table 1: Descriptive statistics of all variables used in the analyses

Then, using this panel dataset, I estimated the following linear model:

$$TreeLoss_{it} = \gamma_1 AKP_{it} + \gamma_2 LogNewDams_{it} + \gamma_3 MiningShare_{it} + \mathbf{X}\beta + \alpha_j + \theta_t + \epsilon_{it}$$

where $TreeLoss_{it}$ is the percentage of tree loss for district i within the period t, $t \in \{2004 - 2008, 2009 - 2013, 2014 - 2018\}$. AKP_{it} is the share of AKP-controlled municipalities (weighted by voters) in a given district i for the period t, $LogNewDams_{it}$ and $MiningShare_{it}$ are the logged number of new dams built and the share of mining enterprises in a given district i for the period t, respectively. $\mathbf{X}$ is the set of other covariates as summarized above. α_j is the set of province dummies (province fixed effect), and θ_t is the set of period dummies (time fixed effect).[64]

4 Results

Before presenting the main results, we can see how tree loss geographically varies across districts. To see that, I created the following map below. It shows that especially coastal districts witnessed higher tree loss in these years while Central Anatolian districts have lower tree loss. Of course, this is partly driven by the weak tree cover in Central Anatolia in the first place. That being said; however, Eastern Black Sea districts seem to perform slightly better than Mediterranean and Aegean districts despite having dense tree cover.

[64] Note that although I use province fixed effects in all specifications, I only use time fixed effects in some specifications to show that the results are robust to alternative specifications. Two-way fixed effects models are difficult to interpret because the model's estimates are a combination of variations in the over-time and cross-sectional effects. See: Jonathan Kropko and Robert Kubinec, "Interpretation and identification of within-unit and cross-sectional variation in panel data models," *PLoS One* 15, no. 4 (2020): e0231349.

That is why the preferred model only uses province-level fixed effects. The standard errors are clustered at the district level for all specifications.

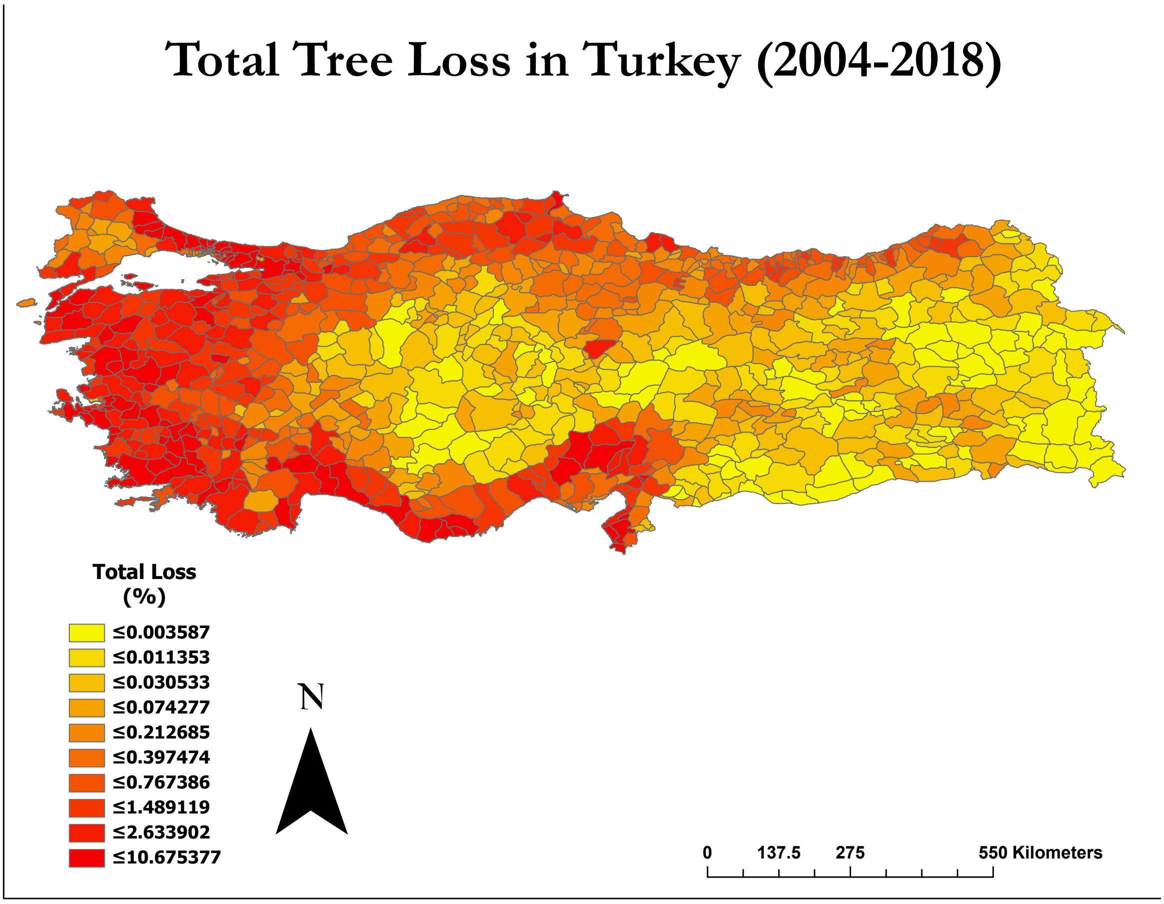

Figure 2: Total tree loss in Turkey

To systematically analyze the correlates of deforestation, I estimated the model specified above. The main results are presented in Table 2. To make sure that outliers do not drive the results, I also excluded extreme values based on the tree loss distribution.[65] In each model, I introduce a new set of variables. All models include every primary variable of interest: AKP rule, average population growth, nightlight difference, mining share, number of new dams, and number of conflicts. I also add geographic (coastal district) and climatic variables (total number of fires, average temperature range, average precipitation, and baseline green share) in order. I control for baseline green areas in the last two models since regions with already poor green areas have fewer trees to lose in the first place. The last model also includes a period fixed effects to account for common shocks. Among all models, three variables are consistently correlated with deforestation in the expected directions: AKP rule, mining share, and the number of new dams.

First, the local AKP rule is positively associated with deforestation at the district level. Using Model 5, we see that one unit increase in local AKP rule, meaning going from a district with no AKP mayor to a district ruled only by AKP mayor(s), positively correlates with tree loss by around 0.35%. This

[65] I excluded observations greater than those at the 97.5*th* percentile and lower than 2.5*th* percentile of the tree loss distribution.

is around 1/10 of the standard deviation of the outcome variable. Given the limited impact of local governments on environmental policy design, this is a substantively sizeable impact. This translates into around 42 football pitches (or approximately 0.3 km^2). Since Model 5 uses data from 827 different districts (excluding outliers), a back-of-the-envelope calculation suggests that in a hypothetical scenario in which only AKP mayors rule in every municipality, there would be tree loss equivalent to a combined area of 35,000 football pitches in each election period.

These results only compare the differential impact of local AKP rule on tree loss by comparing districts among each other. Therefore, they do not capture the effect of the central government. Since the central government's actions can affect tree cover in non-AKP municipalities as well, these results are underestimating the AKP's actual impact on the tree cover by making AKP and non-AKP municipalities look similar in terms of tree cover loss.

Turning to the central government's extractivist policies in mining, energy, and tourism, we see that the mining share variable is positively associated with deforestation, although this variable is statistically significant only at the 10% level in the preferred specification (model 5). In the sample, many districts, such as Çanakkale-Bozcaada, Adana-Feke, and Bolu-Gerede, have zero shares of mining enterprises in 2002 while the maximum mining share is in Kastamonu-Küre (7.2%). Holding everything else constant, going from minimum (0) to maximum value (0.072) of mining share increases tree loss by around 0.21% (0.072×2.898). This suggests that going from a district with no mining activity to the maximum observed in the sample translates into tree loss equivalent to an area of 253 football pitches in a single district for each election period.

Similarly, we observe that building new dams positively correlates with tree loss. Going from one dam to the maximum observed in the sample (7 news dams) translates into tree loss equivalent to an area of 120 football pitches in a single district for each election period. Being a coastal district by itself, on the other hand, is not correlated with tree loss.

	Dependent variable: Total % Tree Loss					
	1	2	3	4	5	6
AKP	0.033**	0.033**	0.033**	0.036**	0.035***	0.029**
	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)	(0.013)
Ave. Pop Growth	0.001	0.001	0.001	0.001	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Nightlight Diff.	0.227**	0.227**	0.232**	0.317***	0.228**	0.085
	(0.100)	(0.100)	(0.101)	(0.107)	(0.098)	(0.108)
Mining Share	3.647***	3.650***	3.674***	3.512**	2.898*	2.951*
	(1.373)	(1.373)	(1.382)	(1.379)	(1.540)	(1.550)
No. of New Dams (log)	0.066***	0.066***	0.065***	0.055***	0.051***	0.045**
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.019)
No. of conflicts (log)	-0.013	-0.013	-0.015	-0.016	-0.017	-0.019*
	(0.013)	(0.013)	(0.013)	(0.013)	(0.011)	(0.011)
Coastal District		0.002	0.001	-0.016	0.025	0.017
		(0.069)	(0.070)	(0.069)	(0.064)	(0.064)
Total No. of Fires (log)			0.005	0.008	0.012**	0.012**
			(0.005)	(0.005)	(0.005)	(0.005)
Average Temp. Range				-0.008	0.034***	0.027**
				(0.010)	(0.011)	(0.011)
Average Precipitation				0.004***	0.002**	0.001
				(0.001)	(0.001)	(0.001)
Baseline Green (share)					0.769***	0.778***
					(0.095)	(0.096)
Num.Obs.	2572	2572	2572	2563	2563	2563
R2	0.479	0.479	0.480	0.492	0.539	0.546
R2 Adj.	0.461	0.461	0.461	0.474	0.522	0.529
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	No	No	No	No	No	Yes

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Standard errors are clustered at the district level

Table 2: The correlates of tree loss in Turkey

Other variables are also correlated with tree loss in expected directions, although some are not statistically significant at conventional levels. For instance, nightlight difference, a proxy for economic activity, is positively correlated with tree loss, although it is not significant in the last model. Similarly, the coefficient for average population growth is positive but not significant. The number of conflicts does not seem to be correlated with deforestation either.

Among the climatic factors, we see that temperature range is positively correlated with deforestation, suggesting that places with higher variability in temperature are also more likely to witness tree loss. On the other hand, Average Precipitation is not correlated with tree loss once I include baseline green share and period fixed effects in the models (as in Model 6).

Last, we see that the total number of fires is positively correlated with tree loss as expected. The average number of fires per period is around 60 per district, while Mardin-Kızıltepe has the highest number with 4456 fires recorded for the period 2014-2019, which is a clear outlier. Holding everything else constant, going from one fire ($25th$ percentile) to 33 fires ($75th$ percentile) in a given district suggests

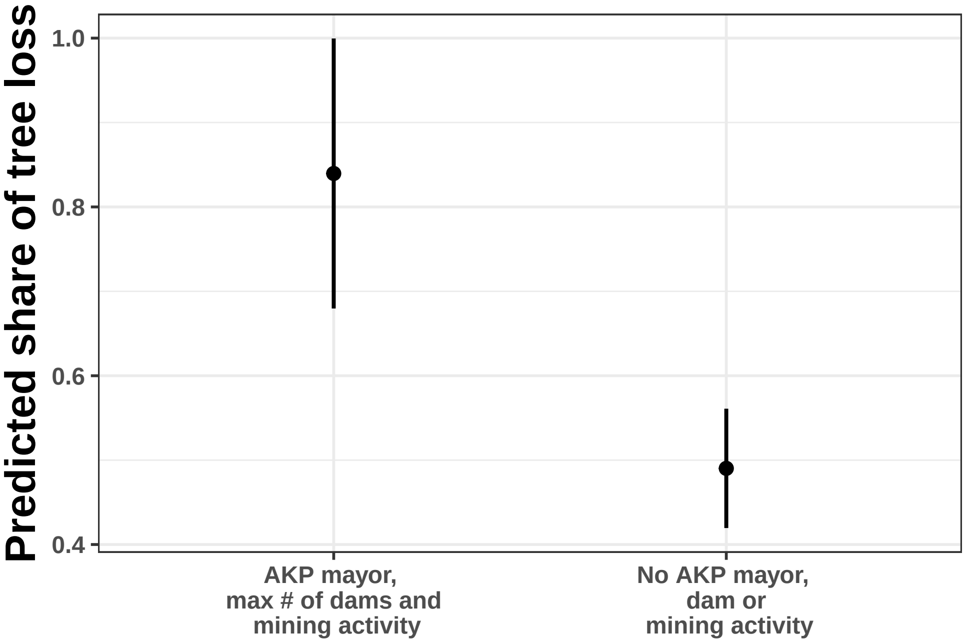

Figure 3: Predicted tree loss in two hypothetical districts

an increase in tree loss by around 0.04% for a given district in each period. This translates into an area equivalent to 50 football pitches.

To further analyze how our main variables of interest, AKP rule, mining share, and new dams, jointly impact tree loss in the analyzed time frame, I use Model 5 in Table 2 to simulate expected tree loss under two hypothetical scenarios. The first hypothetical district has no AKP mayor and has no mining activity or new dams built during the analyzed period. The second hypothetical district's municipalities are all governed by AKP mayors, has the highest observed mining activity in the sample (7.2% of all enterprises in the district is mining), and witnessed the highest number of new dams built (7 new dams). I hold all other variables at their central tendencies (mean or median) and calculate these two hypothetical districts' predicted tree loss shares. The result is plotted in Figure 3. The predicted tree loss share in the first hypothetical district is 0.84% $[0.68, 0.99]$. In the second hypothetical district with no AKP mayor, a new dam, or mining activity, on the other hand, the predicted tree loss is 0.49% $[0.42, 0.56]$. These results imply that the combined effect of all these three variables brings about an average 71% increase in tree loss.

To show that the results are not model dependent, I conduct a series of robustness analyses. First, I repeat the analyses in Table 3 below by excluding three major cities (İstanbul, Ankara, İzmir) in the first two models. In the next two models, I exclude central districts from the sample and repeat the analyses. The results are substantively similar for our main variables of interest, alleviating the concerns that the results are purely driven by İstanbul, Ankara, İzmir or central districts in each province. In the

Appendix section, I also repeat the analyses by including the outliers into the sample and the results are substantively similar (Table 4).

	Dependent variable: Total % Tree Loss			
	No outlier & No big three city	No outlier & No big three city	No outlier & No central district	No outlier & No central district
AKP	0.031**	0.025*	0.042***	0.036**
	(0.013)	(0.013)	(0.014)	(0.014)
Ave. Pop Growth	0.000	0.000	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Nightlight Diff.	0.487***	0.142	0.242**	0.108
	(0.157)	(0.167)	(0.102)	(0.111)
Mining Share	2.666*	2.732*	2.901*	2.962*
	(1.465)	(1.472)	(1.537)	(1.549)
No. of New Dams (log)	0.056***	0.050***	0.054***	0.047**
	(0.018)	(0.019)	(0.020)	(0.021)
No. of conflicts (log)	-0.008	-0.009	-0.023*	-0.024**
	(0.009)	(0.009)	(0.012)	(0.012)
Coastal District	0.090	0.084	0.029	0.020
	(0.069)	(0.070)	(0.064)	(0.065)
Total No. of Fires (log)	0.008	0.007	0.011**	0.012**
	(0.005)	(0.005)	(0.005)	(0.005)
Average Temp. Range	0.022**	0.014	0.038***	0.031***
	(0.011)	(0.011)	(0.010)	(0.011)
Average Precipitation	0.002**	0.001	0.002**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Baseline Green (share)	0.568***	0.573***	0.784***	0.794***
	(0.084)	(0.084)	(0.095)	(0.097)
Num.Obs.	2357	2357	2356	2356
R2	0.530	0.538	0.535	0.542
R2 Adj.	0.511	0.519	0.517	0.524
Province FE	Yes	Yes	Yes	Yes
Period FE	No	Yes	No	Yes

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Standard errors are clustered at the district level

Table 3: The correlates of tree loss in Turkey (excluding major cities and central districts)

As a further robustness check, I created another variable to measure the intensity of local AKP rule. Instead of weighting by population under AKP municipalities, I created a dummy variable that takes the value 1 if all people in the district are governed by AKP mayors. The rest is coded is 0. Note that this is the most conservative measure for local AKP rule since many AKP-ruled municipalities are coded as 0 in this approach. Hence, this variable compares districts exclusively governed by AKP mayors with others. The results are presented in the Appendix section and repeated for all the analyses conducted above.[66]

[66]See Table 5, Table 6, 7 in the Appendix.

5 Conclusion

This paper provided the first systemic empirical analysis on the correlates of deforestation in Turkey. The results show that deforestation in districts with AKP-municipalities is higher than in non-AKP municipalities. Similarly, new dams and increased mining activities are positively associated with deforestation. These results are robust to including a different set of controls and model specifications. By providing an empirical analysis, this paper aims to contribute to the debates on the drivers of deforestation in Turkey.

Although the results show that AKP municipalities are more likely to witness tree loss, they do not tell us *why* this is the case. One plausible mechanism is rent-seeking: AKP municipalities are more flexible in catering to private interests at the expense of the environment when judicial oversight does not work, and the media is politically captured. It could also be that AKP municipalities might be more willing to sacrifice the environment in exchange for various infrastructural, residential, and industrial projects. The empirical analysis presented in this paper cannot disentangle these different mechanisms, and future studies should focus more on identifying distinct mechanisms that affect tree loss.

The impact of other factors is easier to interpret and put into context. The results show that mining activities and new dams positively correlate with deforestation. Holding everything else constant, going from no mining activity to the maximum level of activity observed in the sample is correlated with higher deforestation by an area of around 253 football pitches in a given district. The adverse impact of the dams is around half of the mining impact since building six new dams, observed maximum in the sample, is positively correlated with deforestation by around 120 football pitches. It should be kept in mind that these results should not be interpreted as the "causal" effects since the research design does not allow us a clear causal identification strategy.

On the other hand, conflict does not seem to be correlated with deforestation, unlike the findings of the previous studies. Two reasons could drive this. First, these studies focus on the 1990s where the conflict between Kurdish insurgents and the state forces was the most intense.[67] This paper, on the other hand, focuses on the post-2000s, where the intensity of conflict was much lower. Second, both studies that find an impact focus only on one region, while this study conducts a systemic analysis of all districts for three different election periods.[68]

Satellite data allows us to study the correlates of deforestation in Turkey while it is not feasible to conduct the same analysis with official data. In addition to studying deforestation, future studies can also leverage remote sensing to study other environmental problems such as air pollution[69] and water

[67] Van Etten et al., "Environmental destruction as a counterinsurgency strategy in the Kurdistan region of Turkey"; Gurses, "Environmental consequences of civil war: evidence from the Kurdish conflict in Turkey."

[68] Van Etten et al., "Environmental destruction as a counterinsurgency strategy in the Kurdistan region of Turkey"; Gurses, "Environmental consequences of civil war: evidence from the Kurdish conflict in Turkey."

[69] Pawan Gupta et al., "Satellite remote sensing of particulate matter and air quality assessment over global cities," *Atmospheric Environment* 40, no. 30 (2006): 5880–5892.

quality[70] and analyze how politics, both at the national and local level, impacts these environmental issues. Using such data alleviates the need for official data, which might be distorted, low quality, aggregated at levels that mask the variation, or non-existent at all. Future studies should look more for such data sources, especially in authoritarian settings where governments manipulate information.

[70] Jerry C Ritchie, Paul V Zimba, and James H Everitt, "Remote sensing techniques to assess water quality," *Photogrammetric engineering & remote sensing* 69, no. 6 (2003): 695–704.

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6 Appendix

	Dependent variable: Total % Tree Loss					
	1	2	3	4	5	6
AKP	0.045**	0.048**	0.048**	0.057***	0.054***	0.048**
	(0.022)	(0.022)	(0.022)	(0.022)	(0.019)	(0.019)
Ave. Pop Growth	0.003*	0.003*	0.003*	0.002	0.002	0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Nightlight Diff.	0.410***	0.412***	0.418***	0.508***	0.367***	0.191
	(0.136)	(0.138)	(0.138)	(0.135)	(0.124)	(0.137)
Mining Share	5.569***	5.731***	5.809***	5.438***	4.621**	4.556**
	(1.975)	(1.987)	(1.999)	(1.949)	(2.281)	(2.248)
No. of New Dams (log)	0.054**	0.055***	0.052**	0.037*	0.031	0.024
	(0.021)	(0.021)	(0.021)	(0.021)	(0.022)	(0.023)
No. of conflicts (log)	-0.004	-0.004	-0.007	-0.006	-0.008	-0.009
	(0.029)	(0.029)	(0.029)	(0.030)	(0.026)	(0.026)
Coastal District		0.081	0.078	0.046	0.117	0.107
		(0.115)	(0.116)	(0.117)	(0.109)	(0.110)
Total No. of Fires (log)			0.010	0.013*	0.020***	0.020***
			(0.008)	(0.008)	(0.007)	(0.007)
Average Temp. Range				-0.023	0.046***	0.037**
				(0.018)	(0.017)	(0.018)
Average Precipitation				0.005***	0.002	0.001
				(0.002)	(0.002)	(0.002)
Baseline Green (share)					1.289***	1.299***
					(0.154)	(0.156)
Num.Obs.	2754	2754	2754	2742	2742	2742
R2	0.365	0.365	0.366	0.380	0.442	0.447
R2 Adj.	0.344	0.345	0.345	0.359	0.423	0.428
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	No	No	No	No	No	Yes

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Standard errors are clustered at the district level

Table 4: The correlates of tree loss in Turkey (including outliers)

6.1 Alternative measure for the local AKP rule

	Dependent variable: Total % Tree Loss					
	1	2	3	4	5	6
AKP (binary)	0.032***	0.032**	0.034***	0.034***	0.042***	0.026**
	(0.012)	(0.013)	(0.013)	(0.013)	(0.012)	(0.012)
Ave. Pop Growth	0.001	0.001	0.001	0.001	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Nightlight Diff.	0.229**	0.229**	0.234**	0.318***	0.225**	0.092
	(0.101)	(0.101)	(0.102)	(0.107)	(0.099)	(0.109)
Mining Share	3.611***	3.609***	3.640***	3.466**	2.856*	2.904*
	(1.381)	(1.380)	(1.388)	(1.384)	(1.542)	(1.558)
No. of New Dams (log)	0.067***	0.067***	0.065***	0.055***	0.051***	0.046**
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.019)
No. of conflicts (log)	-0.013	-0.013	-0.015	-0.015	-0.016	-0.019*
	(0.013)	(0.013)	(0.013)	(0.013)	(0.011)	(0.011)
Coastal District		-0.001	-0.002	-0.021	0.022	0.013
		(0.069)	(0.069)	(0.069)	(0.064)	(0.064)
Total No. of Fires (log)			0.007	0.009*	0.013***	0.013***
			(0.005)	(0.005)	(0.005)	(0.005)
Average Temp. Range				-0.009	0.033***	0.027**
				(0.010)	(0.011)	(0.011)
Average Precipitation				0.004***	0.002**	0.001
				(0.001)	(0.001)	(0.001)
Baseline Green (share)					0.777***	0.782***
					(0.095)	(0.096)
Num.Obs.	2572	2572	2572	2563	2563	2563
R2	0.479	0.479	0.480	0.492	0.540	0.546
R2 Adj.	0.461	0.461	0.462	0.474	0.524	0.529
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	No	No	No	No	No	Yes

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Standard errors are clustered at the district level

Table 5: The correlates of tree loss in Turkey (alternative AKP measure)

	Dependent variable: Total % Tree Loss			
	No outlier & No big three city	No outlier & No big three city	No outlier & No central district	No outlier & No central district
AKP (binary)	0.038***	0.022*	0.044***	0.028**
	(0.012)	(0.012)	(0.012)	(0.013)
Ave. Pop Growth	0.000	0.000	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Nightlight Diff.	0.467***	0.147	0.242**	0.117
	(0.157)	(0.167)	(0.103)	(0.111)
Mining Share	2.632*	2.693*	2.849*	2.901*
	(1.467)	(1.479)	(1.544)	(1.562)
No. of New Dams (log)	0.057***	0.051***	0.054***	0.048**
	(0.018)	(0.019)	(0.020)	(0.020)
No. of conflicts (log)	-0.007	-0.009	-0.023*	-0.025**
	(0.009)	(0.009)	(0.012)	(0.012)
Coastal District	0.088	0.081	0.025	0.016
	(0.069)	(0.070)	(0.064)	(0.064)
Total No. of Fires (log)	0.009*	0.008*	0.013**	0.012**
	(0.005)	(0.005)	(0.005)	(0.005)
Average Temp. Range	0.021**	0.014	0.038***	0.032***
	(0.011)	(0.011)	(0.010)	(0.011)
Average Precipitation	0.002**	0.001	0.002**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Baseline Green (share)	0.575***	0.576***	0.791***	0.798***
	(0.084)	(0.085)	(0.095)	(0.097)
Num.Obs.	2357	2357	2356	2356
R2	0.531	0.537	0.536	0.542
R2 Adj.	0.513	0.519	0.518	0.523
Province FE	Yes	Yes	Yes	Yes
Period FE	No	Yes	No	Yes

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Standard errors are clustered at the district level

Table 6: The correlates of tree loss in Turkey (excluding major cities and central districts) (alternative AKP measure)

	Dependent variable: Total % Tree Loss					
	1	2	3	4	5	6
AKP (binary)	0.039**	0.041**	0.044**	0.049***	0.060***	0.041**
	(0.019)	(0.019)	(0.019)	(0.019)	(0.017)	(0.018)
Ave. Pop Growth	0.003*	0.003*	0.003*	0.002	0.002	0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Nightlight Diff.	0.414***	0.417***	0.422***	0.511***	0.362***	0.203
	(0.138)	(0.139)	(0.140)	(0.137)	(0.126)	(0.139)
Mining Share	5.518***	5.664***	5.756***	5.365***	4.551**	4.495**
	(1.987)	(1.999)	(2.012)	(1.960)	(2.281)	(2.264)
No. of New Dams (log)	0.055***	0.055***	0.052**	0.038*	0.031	0.025
	(0.021)	(0.021)	(0.021)	(0.021)	(0.022)	(0.023)
No. of conflicts (log)	-0.003	-0.003	-0.007	-0.006	-0.007	-0.008
	(0.029)	(0.029)	(0.030)	(0.030)	(0.026)	(0.026)
Coastal District		0.075	0.073	0.038	0.111	0.101
		(0.115)	(0.116)	(0.117)	(0.109)	(0.110)
Total No. of Fires (log)			0.011	0.015*	0.022***	0.022***
			(0.008)	(0.008)	(0.007)	(0.007)
Average Temp. Range				-0.024	0.045***	0.037**
				(0.018)	(0.017)	(0.018)
Average Precipitation				0.005***	0.002	0.001
				(0.002)	(0.002)	(0.002)
Baseline Green (share)					1.300***	1.305***
					(0.155)	(0.157)
Num.Obs.	2754	2754	2754	2742	2742	2742
R2	0.364	0.365	0.366	0.380	0.443	0.447
R2 Adj.	0.344	0.344	0.345	0.359	0.424	0.427
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	No	No	No	No	No	Yes

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Standard errors are clustered at the district level

Table 7: The correlates of tree loss in Turkey (including outliers) (alternative AKP measure)