


ARTICLE

Correlates of deforestation in Turkey: evidence from high-resolution satellite data

Fatih Serkant Adiguzel 

Sabancı University, Faculty of Arts and Social Sciences, Istanbul, Turkey
Email: serkant.adiguzel@sabanciuniv.edu

Abstract

During the last decade, environmental issues have gained saliency in Turkish politics, especially after the 2013 Gezi Park demonstrations. This article is on the relationship between politics and deforestation in Turkey. It combines possible major drivers—political, economic, and climatic—of deforestation in Turkey with high-resolution satellite data on deforestation to conduct a systemic empirical analysis. The results show that districts in which Justice and Development Party mayors are in power have higher deforestation. The effect is around an average combined area of forty-two football fields in a given district. The article also shows that increased mining activities and newly built hydropower plants positively correlate with deforestation.

Keywords: deforestation; satellite data; environmental politics; Turkey

Introduction

Environmental issues have increasingly become one of the most contentious topics in Turkish politics over the last decade. These issues have gained saliency, especially after the Gezi Park demonstrations, which began in 2013 to defend the last green area in Taksim, the main square in İstanbul.¹ 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 Justice and Development Party (AKP) government, which has been in power since 2002, for destroying forests for infrastructural and energy projects and mining activities, the government and its leader President Recep Tayyip Erdoğan deny the allegations. Erdoğan even claims that his government planted “4.5 billion trees” under his leadership.² These conflicting claims are made when high-resolution satellite data on forests are available, making it possible to analyze deforestation.

Although the desire to grow economically at the expense of the environment has been the central theme in every political movement in Turkey (Arsel 2016), Turkey’s current “competitive authoritarian” regime (Esen and Gumuscu 2016; Levitsky and

¹ I thank Goncağül Akbaba for excellent research assistance.

² See Türkiye Cumhuriyeti İletişim Başkanlığı (2019).

Way 2010) poses two distinct threats to the environment. While the competitive nature of elections, despite its unfairness, can make politicians more willing to sacrifice trees for votes (Cisneros et al. 2021; Pailler 2018), the absence of effective horizontal checks on the executive branch, such as an independent judiciary, creates amenable conditions for political rent creation (Acemoglu et al. 2013; Persson et al. 1997) in which forests are abused through corrupt practices.

Although we know that forests have been destroyed throughout the last few decades in Turkey,³ 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 correlates with deforestation in the country. This article 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" (Hansen et al. 2013, p. 850).

The article conducts a systemic empirical analysis by bringing together possible major drivers of deforestation and using high-resolution satellite data to measure tree loss. The satellite data has various advantages over administrative data on forest coverage. First, the General Directorate of Forestry (*Orman Genel Müdürlüğü*) does not release annual data on forests (Türkiye Ormanlılar Derneği 2019, p. 14). The directorate works on a forested area of around two million hectares each year, taking ten years to cover the whole country. The latest data on forested areas in certain regions is twenty years old (Türkiye Ormanlılar Derneği 2019). Therefore, it is not possible to use official data on forests to understand the drivers of deforestation because the data comes with severe time lag.⁴ Moreover, the released data are at the province level and do not allow fine-granular analysis at smaller geographical units. Third, data transparency and quality pose serious issues, especially in democratically backsliding countries like Turkey, because information manipulation is one of the primary ways to maintain legitimacy (Guriev and Treisman 2019).

However, high-resolution satellite data allows us to track changes in forested areas at fine-granular levels (thirty-meter resolution) annually. More importantly, data quality is not impacted by political considerations. Finally, defining deforestation with respect to the Landsat pixel scale means that the measurement does not suffer from different definitions of forest,⁵ 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 hydropower plants, and mining activities. Having a district (*ilçe*) whose municipalities are all governed by AKP mayor(s)⁶ correlates with higher tree loss by around forty-two football fields in a given district for each election period. Similarly, a district has higher tree loss by about 253 football fields if the share of mining

³ See, for instance, Global Forest Watch (n.d.).

⁴ Günşen and Atmış (2019) use the official data to track deforestation at the province level and conclude that sixty out of eighty-one provinces witnessed an increase in their forest areas between 2005 and 2015.

⁵ For instance, the United Nations Framework Convention on Climate Change defines forests differently than the Food and Agriculture Organization. See Tolunay (2017).

⁶ Note that municipalities are nested within districts.

enterprises increases from none to 7 percent.⁷ Building new hydropower plants is also correlated with higher tree loss: Going from one new hydropower plant to seven new plants, which is the maximum observed in the sample, is positively associated with tree loss by around 120 football fields in that district.

This article 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 (Burgess et al. 2012; Cisneros et al. 2021; Pailler 2018; Sanford 2021). It is also linked with scholarly works that analyze the impact of local governments on deforestation (Cisneros et al. 2021; Lemos and Agrawal 2006; Ribot et al. 2006). 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 (Orhan 2013). Last, quantifying impacts allows us to compare the adverse impacts of various industries.

This article's structure 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. The results are presented in the fourth section. The discussion is upended with a conclusion.

Correlates of deforestation

Since the foundation of the Turkish republic, the idea of development through rapid economic growth has not been challenged by any political movement (Arsel 2016). Despite differences in other dimensions (economic ideology and progressive or conservative values), political parties in Turkey, irrespective of their ideology, have always supported developmental projects (Paker et al. 2013; Turhan et al. 2016). However, the desire to grow economically at the expense of the environment has increased dramatically with the AKP governments (Akbulut and Adaman 2013), both through the actions/policies of the central and local AKP governments. This became possible with the AKP's increasing authoritarianism as authoritarian power 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 not theoretically clear. Although politics is recognized as an essential contributor to environmental issues in general and deforestation in particular, disagreement exists in how the two interact. It is known that democracies provide more welfare to their citizens than nondemocracies (Przeworski et al. 2000) because democracy forces the leaders to heed the needs of the masses (Mill 2004 [1861]) and makes political leaders more responsive to the popular demands for environmental protection (Barrett and Graddy 2000; Farzin and Bond 2006). 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

⁷ Küre district in Kastamonu province has the maximum level of mining activity observed in the data, which is 7.2 percent.

to prevent tree loss (Klopp 2012, p. 352). By “democratizing” 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 out that the relationship between democracy and the environment is not that clear cut (Buitenzorg and Mol 2011) and that democratization and local governance do not guarantee the prevention of tree loss. On the contrary, patronage politics causes 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 (Klopp 2012). Reelection incentives make politicians more willing to sacrifice trees for votes (Cisneros et al. 2021; Paillet 2018), creating “political logging cycles” (Burgess et al. 2012). The recent evidence has shown that democratization can bring further deforestation, especially in weak democracies with highly competitive elections (Sanford 2021).

Turkey’s regime is best characterized as “competitive authoritarian” (Çalışkan 2018; Esen and Gumuscu 2016; Levitsky and Way 2010). In these regimes, elections are still competitive despite being unfair.⁸ I argue that the competitive authoritarian nature of the regime provides a setting that gets the environmentally damaging characteristics of both democratic and authoritarian regimes. Reelection pressures do not fade away in competitive authoritarian regimes, unlike fully authoritarian regimes. The electoral pressures coming from competitive elections make the government ignore the environment because 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 (Adiguzel 2022). 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 a much-increased pace and without any input from the public (Özkaynak et al. 2020), due to the nature of the competitive authoritarian regime. In such an institutional setting, local AKP governments, 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 were more easily catered to over the last decade in Turkey (Gürakar-Çeviker 2016; Gürakar-Çeviker and Meyersson 2016). As a result, “unprecedented extractivist drive” (Adaman et al. 2019, p. 514) in various sectors such as mining, energy, and construction became possible, which brought significant environmental problems, including deforestation (Adaman and Akbulut 2021).

The energy sector is one of the primary sectors where we see the impacts of AKP’s unprecedented modernist ambitions (Özkaynak et al. 2020). The AKP government started a series of legal changes that opened the electricity market to the private sector after they came to power (Eren 2018). The desire to reduce dependence on fossil

⁸ The government lost major provinces such as İstanbul and Ankara in March 2019 local elections, showing the competitive nature of the elections despite their unfairness.

fuels made hydroelectric power plants one of the favorite methods to produce electricity. As a result, the government has been aiming 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 (*ibid.*). Indeed, in a speech in 2020, President Erdoğan claimed that his government built 585 new hydroelectric power plants.⁹ 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 largely been ignored (Özkaynak et al. 2020). Yet, the energy production capacity increased threefold (Erensü 2018). 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 (Abbasi and Abbasi 2011; Pang et al. 2015). Unsurprisingly, their adverse effects on the environment, including but not limited to tree loss, created especially local opposition (Sayan 2019; Sayan and Kibaroglu 2016).

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 (Adaman et al. 2022). In addition to increasing environmental costs, this practice also brought about tragic incidents such as the Soma mining disaster.¹⁰

By using remote sensing methods, some previous studies have already shown adverse environmental impacts of mining operations (Gül et al. 2019). In Soma, for instance, where 31 percent of the domestic lignite production takes place, places around the mining areas witness water and air pollution, lower agricultural yield, and deforestation (Karadag 2012). Even when such mining operations stop, studies showed that abandoned open-pit mines can continue to pollute the environment (Yucel and Baba 2013).

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 (UNWTO 2020). 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 (Kuvan 2010). 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.¹¹

In addition to the central government's extractivist drive in mining, energy, and construction, the competitive authoritarianism also incentivizes local AKP governments to prioritize economic growth and rent creation at the expense of the environment. Although political patronage has always been a historical problem for Turkey (Heper and Keyman 1998), the AKP government made it the basis of the competitive authoritarian regime (Esen and Gumuscu 2018, p. 351). 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 (Orhan 2013). Moreover, local

⁹ See Anadolu Agency (2020).

¹⁰ A total of 301 people were killed due to an explosion and underground mine fire in a coal mine in 2014 in Soma, Manisa, Turkey. This is the worst mine disaster in the country's history.

¹¹ See Ünker (2021).

governments in Turkey play direct roles in preserving green areas in urban spaces because 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 governments are responsible for green areas (Toprak 2017). 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 (Gurses 2012; Van Etten et al. 2008). 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 that follow.

After presenting the empirical strategy and data in the next section, I will show that activities in the mining and energy sectors correlate with deforestation in the country. Moreover, I will show that deforestation is higher in districts run by AKP mayors.

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. (2013). They use Landsat data to compile high-resolution global maps of tree cover change. 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 (Iverson et al. 1989).

Because this data is high resolution (around thirty meters), I aggregated them at the district (*ilçe*) level. In particular, I calculated the percentage of tree loss of the total net land.¹² That is, for each district and year, I first counted the number of pixels—each is around 625 m²—that witnessed tree loss.¹³ 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 Istanbul map in which I highlighted pixels that witnessed tree loss in different periods. As you can see in Figure 1, the new airport's damage to 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.

Based on the discussion in the previous section, I identified several variables that would correlate with deforestation. First, to identify local governments' impact on

¹² It is “net” because I excluded permanent water bodies such as rivers, lakes, and reservoirs from the calculations.

¹³ Although the resolution is thirty meters, this is the value you would get at the Equator. It gets smaller as one moves toward the poles, and the resolution is around twenty-five meters in Turkey.

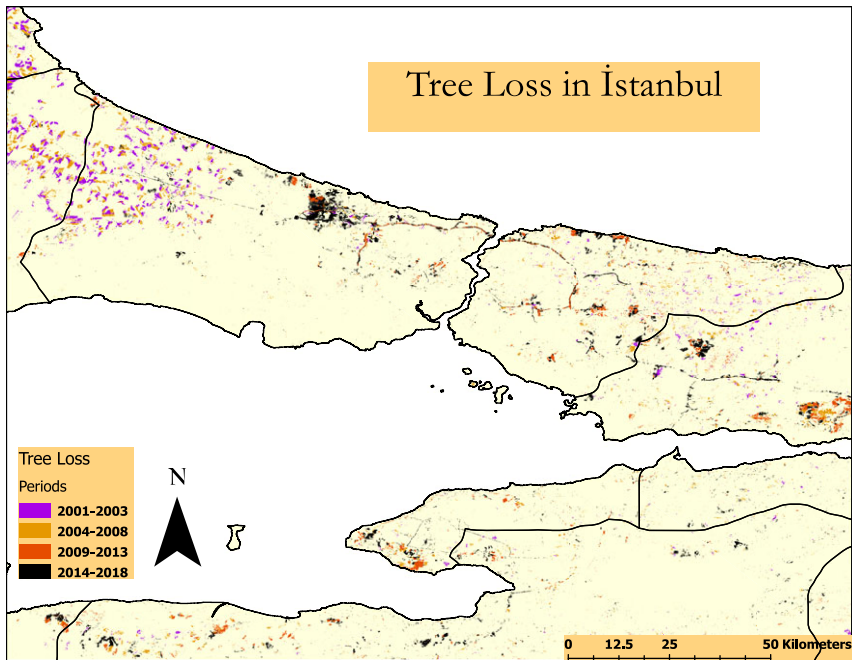


Figure 1. Tree loss in İstanbul and its surroundings in different periods.

deforestation, I created a measure to proxy for the AKP's local rule intensity. For each election period, I identify the mayors' partisan affiliations. Because 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 two-thirds in this weighted specification, as opposed to one-half. Although I use this weighted AKP local rule variable as my independent variable in the analyses that follow, 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 2014 change in the Metropolitan Municipal Law.

To measure the impact of hydroelectric plants, I created an original dataset on the new hydropower plants built in the analyzed period. I used various sources such as the online energy atlas¹⁴ and various government reports¹⁵ to determine the date and the location of each new hydropower plant built. As a result, I managed to identify 502 hydropower plants built in the analyzed period (2004–2018). Because this is a count

¹⁴ See Enerji Atlası (n.d).

¹⁵ 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.

variable, I log-transformed it before using it in the analyses and created *No. of New Hydropower Plants (log)* variable.¹⁶

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. Given that the mining law has changed in 2004, the numbers from 2002 are mostly underestimating the current mining practices. 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 (Geist and Lambin 2002; Günşen and Atmiş 2019; Tolunay 2017). Therefore, we should expect higher tree loss in places that witness higher economic activity and population growth. The first measure 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 in which official statistics do not exist or are not reliable (Düşündere Taşöz 2019; Henderson et al. 2012; Hu and Yao 2019). Because the nightlight data series changed after 2013,¹⁷ 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 because population growth can also cause increases in tree loss.

As mentioned in the preceding text, because various studies have 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 (Sundberg and Melander 2013). This dataset includes information about the location of conflicts worldwide.¹⁸ 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.¹⁹

I also control for climatic factors that can explain tree loss in certain regions in three ways. First, all model specifications in the following text 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

¹⁶ $No. of New Hydropower Plants (log) = \log(No. of New Hydropower Plants + 1)$.

¹⁷ National Centers for Environmental Information (NOAA) produced DMSP-OLS Nighttime Lights Time Series for the period between 1992–2013. After 2013, higher-quality data (VIIRS) was supplied by NASA and NOAA's Suomi National Polar Partnership (SNPP) satellite.

¹⁸ The dataset records "event," which is defined as follows: "An incident where armed force was used by an organised actor against another organized actor, or against civilians, resulting in at least 1 direct death at a specific location and a specific date" (Högbladh 2021, p. 4).

¹⁹ $No. of Conflicts (log) = \log(No. of Conflicts + 1)$.

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

	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 Hydropower Plants (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

models ensure that we are not comparing, say, Artvin, a province on the Black Sea coast with high forest area, with Yozgat, a province without significant green spaces. 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 twenty kilometer spatial resolution (Fick and Hijmans 2017). 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.²⁰ 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.

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

$$\text{TreeLoss}_{it} = \gamma_1 \text{AKP}_{it} + \gamma_2 \text{LogNewHydroPlants}_{it} + \gamma_3 \text{MiningShare}_{it} + X\beta + \alpha_j + \theta_t + \varepsilon_{it}$$

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

²⁰ The data is available here: NASA (2021).

Total Tree Loss in Turkey (2004-2018)

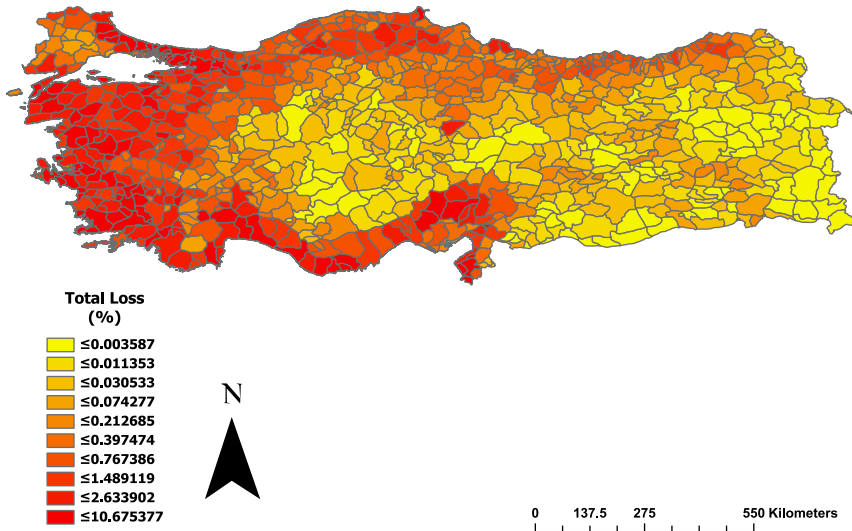


Figure 2. Total tree loss in Turkey.

municipalities (weighted by voters) in a given district i for the period t , $\text{LogNewHydroPlants}_{it}$ and MiningShare_{it} are the logged number of new hydro power plants built and the share of mining enterprises in a given district i for the period t , respectively. X is the set of other covariates as summarized above. α_i is the set of province dummies (province fixed effect), and θ_t is the set of period dummies (time fixed effect).²¹

Results

Before presenting the main results, we can see how tree loss geographically varies across districts. To see that, I created the following map (see Figure 2). 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.

²¹ 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 overtime and cross-sectional effects (Kropko and Kubinec 2020). That is why the preferred model only uses province-level fixed effects. The standard errors are clustered at the district level for all specifications.

To systematically analyze the correlates of deforestation, I estimated the model specified in the preceding text. 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.²² 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 hydropower plants, 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 because 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 0.035 percent. This 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 forty-two football fields (or approximately 0.3 km²). Because 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 fields 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. Because 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.

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 percent 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 percent). Holding everything else constant, going from minimum (0) to maximum value (0.072) of mining share increases tree loss by around 0.21 percent (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 fields in a single district for each election period.

Similarly, building new hydropower plants positively correlates with tree loss. Going from one hydropower plant to the maximum observed in the sample (seven hydropower plants) translates into tree loss equivalent to an area of 120 football fields

²² I excluded observations greater than those at the 97.5th percentile and lower than 2.5th percentile of the tree loss distribution.

Table 2. The correlates of tree loss in Turkey

	1	2	3	4	5	6
AKP	0.033** (0.014)	0.033** (0.014)	0.033** (0.014)	0.036** (0.014)	0.035*** (0.013)	0.029** (0.013)
Ave. Pop Growth	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)
Nightlight Diff.	0.227** (0.100)	0.227** (0.100)	0.232** (0.101)	0.317*** (0.107)	0.228** (0.098)	0.085 (0.108)
Mining Share	3.647*** (1.373)	3.650*** (1.373)	3.674*** (1.382)	3.512** (1.379)	2.898* (1.540)	2.951* (1.550)
No. of New Hydropower Plants (log)	0.066*** (0.018)	0.066*** (0.018)	0.065*** (0.018)	0.055*** (0.018)	0.051*** (0.018)	0.045** (0.019)
No. of conflicts Conflicts (log)	-0.013 (0.013)	-0.013 (0.013)	-0.015 (0.013)	-0.016 (0.013)	-0.017 (0.011)	-0.019* (0.011)
Coastal District		0.002 (0.069)	0.001 (0.070)	-0.016 (0.069)	0.025 (0.064)	0.017 (0.064)
Total No. of Fires (log)			0.005 (0.005)	0.008 (0.005)	0.012** (0.005)	0.012** (0.005)
Average Temp. Range				-0.008 (0.010)	0.034*** (0.011)	0.027** (0.011)
Average Precipitation				0.004*** (0.001)	0.002** (0.001)	0.001 (0.001)
Baseline Green (share)					0.769*** (0.095)	0.778*** (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

Standard errors are clustered at the district level.

* p < 0.1, ** p < 0.05, *** p < 0.01.

in a single district for each election period. Being a coastal district by itself, however, is not correlated with tree loss.

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. However, 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 sixty per district, while Mardin-Kızıltepe has the highest number with 4,456 fires recorded for the period 2014–2019, which is a clear outlier. Holding everything else constant, going from one fire (25th percentile) to thirty-three fires (75th percentile) in a given district suggests an increase in tree loss by around 0.04 percent for a given district in each period. This translates into an area equivalent to fifty football fields.

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 hydropower plant built during the analyzed period. The second hypothetical district's municipalities are all governed by AKP mayors, have the highest observed mining activity in the sample (7.2 percent of all enterprises in the district is mining), and witnessed the highest number of new hydropower plants built (seven). I hold all other variables at their central tendencies (mean or median) and calculate their predicted tree loss shares for these two hypothetical districts. The result is plotted in Figure 3. The predicted tree loss share in the first hypothetical district is 0.84 percent [0.68, 0.99]. In the second hypothetical district with no AKP mayor, a new hydropower plant, or mining activity, however, the predicted tree loss is 0.49 percent [0.42, 0.56]. These results imply that the combined effect of all these three variables brings about an average 71.4 percent 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 by excluding three major cities (İstanbul, Ankara, İzmir) in the first two models. In the following 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, I repeat the analyses by including the outliers into the sample, and the results are substantively similar (Table A1 in the Appendix).

As a further robustness check, I created another variable to measure the intensity of the local AKP rule. Instead of weighting by the population under AKP municipalities, I created a dummy variable that takes the value one if AKP mayors govern all people in the district. The rest is coded as zero. Note that this is the most conservative

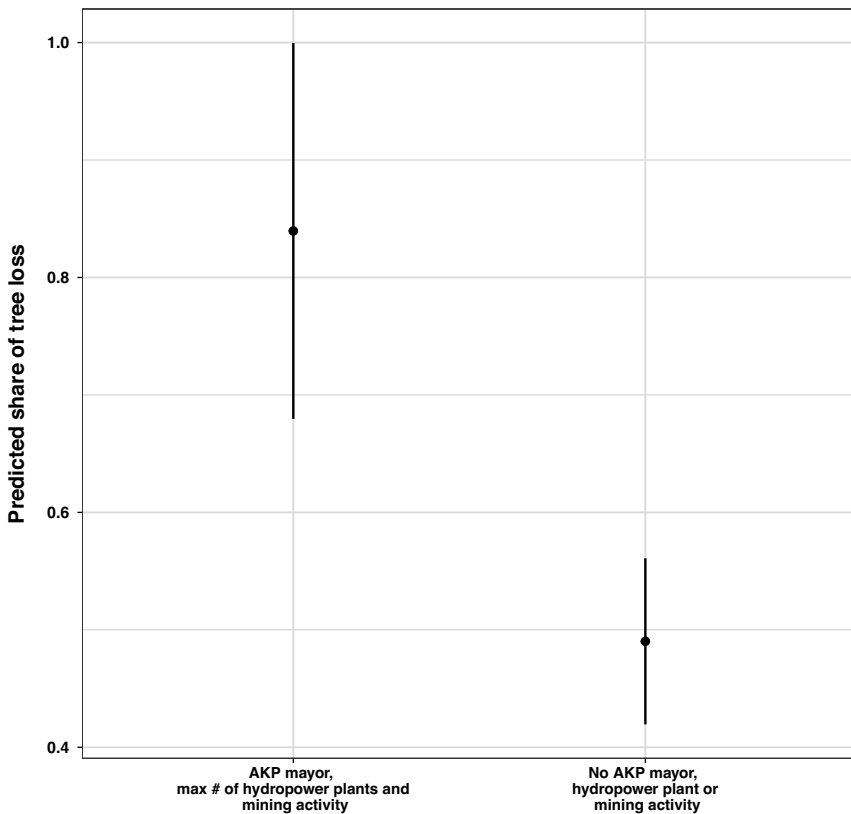


Figure 3. Predicted tree loss in two hypothetical districts.

measure for local AKP rule because 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 and repeated for all the analyses conducted in the preceding text.²³

Conclusion

This article provides 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 hydropower plants 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 article 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:

²³ See Table A2, Table A3, and Table A4 in the Appendix.

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

	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** (0.013)	0.025* (0.013)	0.042*** (0.014)	0.036** (0.014)
Ave. Pop Growth	0.000 (0.001)	0.000 (0.001)	0.001 (0.001)	0.001 (0.001)
Nightlight Diff.	0.487*** (0.157)	0.142 (0.167)	0.242** (0.102)	0.108 (0.111)
Mining Share	2.666* (1.465)	2.732* (1.472)	2.901* (1.537)	2.962* (1.549)
No. of New Hydropower Plants (log)	0.056*** (0.018)	0.050*** (0.019)	0.054*** (0.020)	0.047** (0.021)
No. of Conflicts (log)	-0.008 (0.009)	-0.009 (0.009)	-0.023* (0.012)	-0.024** (0.012)
Coastal District	0.090 (0.069)	0.084 (0.070)	0.029 (0.064)	0.020 (0.065)
Total No. of Fires (log)	0.008 (0.005)	0.007 (0.005)	0.011** (0.005)	0.012** (0.005)
Average Temp. Range	0.022** (0.011)	0.014 (0.011)	0.038*** (0.010)	0.031*** (0.011)
Average Precipitation	0.002** (0.001)	0.001 (0.001)	0.002** (0.001)	0.001 (0.001)
Baseline Green (share)	0.568*** (0.084)	0.573*** (0.084)	0.784*** (0.095)	0.794*** (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

Standard errors are clustered at the district level.

*p < 0.1, **p < 0.05, ***p < 0.01.

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 votes with various infrastructural, residential, and

industrial projects. The empirical analysis presented in this article 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 hydropower plants 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 fields in a given district. The adverse impact of the hydropower plants is around half the mining impact because building six new power plants, the maximum observed in the sample, is positively correlated with deforestation by around 120 football fields. It should be kept in mind that these results should not be interpreted as the “causal” effects because the research design does not allow us a clear causal identification strategy.

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, during which the conflict between Kurdish insurgents and the state forces was the most intense (Gurses 2012; Van Etten et al. 2008). This article, however, focuses on the post-2000s, in which the intensity of conflict was much lower. Second, both studies that found an impact focus only on one region, while this study conducts a systemic analysis of all districts for three different election periods.

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 (Gupta et al. 2006) and water quality (Ritchie et al. 2003) 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 nonexistent at all. Future studies should look more for such data sources, especially in authoritarian settings where governments manipulate information (Adiguzel et al. 2020).

Supplementary material. To view supplementary material for this article, please visit <https://doi.org/10.1017/npt.2022.28>

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References

- Abbasi T and Abbasi S (2011) Small hydro and the environmental implications of its extensive utilization. *Renewable and Sustainable Energy Reviews* 15(4), 2134–2143. <https://doi.org/10.1016/j.rser.2010.11.050>.
- Acemoglu D, Robinson J and Torvik R (2013) Why do voters dismantle checks and balances? *Review of Economic Studies* 80(3), 845–875. <https://doi.org/10.1093/restud/rdt007>.
- Adaman F and Akbulut B (2021) Erdoğan's three-pillared neoliberalism: authoritarianism, populism and developmentalism. *Geoforum* 124, 279–289. <https://doi.org/10.1016/j.geoforum.2019.12.013>.
- Adaman F, Arsel M and Akbulut B (2019) Neoliberal developmentalism, authoritarian populism, and extractivism in the countryside: the Soma mining disaster in Turkey. *The Journal of Peasant Studies* 46(3), 514–536. <https://doi.org/10.1080/03066150.2018.1515737>.

- Adiguzel, FS** (2022) *Essays on the Political Economy of Media and Information Manipulation*, Dissertation, Duke University. Accessed January 29, 2023. <https://hdl.handle.net/10161/25797>.
- Adiguzel FS, Cansunar A and Corekcioglu G** (2020) Truth or dare? Detecting systematic manipulation of COVID-19 statistics. *Journal of Political Institutions and Political Economy* 1(4), 543–557. <http://doi.org/10.1561/113.00000021>.
- Akbulut B and Adaman F** (2013) The unbearable charm of modernization: growth fetishism and the making of state in Turkey. *Perspectives: Political Analysis and Commentary from Turkey* 5(13), 1–10.
- Anadolu Agency** (2020) Cumhurbaşkanı Erdoğan: Türkiye 2002’de 276 baraja sahipti biz buna 585 baraj daha ekledik. Accessed September 27, 2022. <https://www.aa.com.tr/tr/turkiye/cumhurbaskani-erdogan-turkiye-2002de-276-baraja-sahipti-biz-buna-585-baraj-daha-ekledik/1846502>.
- Arsel M** (2016) Reflexive developmentalism? Toward an environmental critique of modernization. In Adaman F and Arsel M (eds), *Environmentalism in Turkey*. Routledge, 29–48.
- Barrett S and Graddy K** (2000) Freedom, growth, and the environment. *Environment and Development Economics* 5(4), 433–456. <https://doi.org/10.1017/S1355770X00000267>.
- Buitenzorg M and Mol AP** (2011) Does democracy lead to a better environment? Deforestation and the democratic transition peak. *Environmental and Resource Economics* 48(1), 59–70. <https://doi.org/10.1007/s10640-010-9397-y>.
- Burgess R, Hansen M, Olken BA, Potapov P and Sieber S** (2012) The political economy of deforestation in the tropics. *The Quarterly Journal of Economics* 127(4), 1707–1754. <https://doi.org/10.1093/qje/qjs034>.
- Çalışkan, K** (2018) Toward a new political regime in Turkey: from competitive toward full authoritarianism. *New Perspectives on Turkey* 58, 5–33. <https://doi.org/10.1017/npt.2018.10>.
- Cisneros E, Kis-Katos K and Nuryartono N** (2021) Palm oil and the politics of deforestation in Indonesia. *Journal of Environmental Economics and Management* 108, 102453. <https://doi.org/10.1016/j.jeem.2021.102453>.
- Düşündere Taşöz A** (2019) 1992–2018 dönemi için gece ışıklarıyla il bazında GSYH tahmini: 2018’de 81 ilin büyüme performansı. Türkiye Ekonomi Politikaları Araştırma Vakfı. Accessed June 9, 2022. <http://www.tepav.org.tr/tr/haberler/s/4450>.
- Enerji Atlası** (n.d.). Enerji atlası. Accessed March 23, 2022. <https://www.enerjiatlası.com/hidroelektrik/>.
- Eren A** (2018) Transformation of the water-energy nexus in Turkey: re-imagining hydroelectricity infrastructure. *Energy Research & Social Science* 41, 22–31. <https://doi.org/10.1016/j.erss.2018.04.013>.
- Erensü S** (2018) Powering neoliberalization: energy and politics in the making of a new Turkey. *Energy Research & Social Science* 41, 148–157. <https://doi.org/10.1016/j.erss.2018.04.037>.
- Esen B and Gumuscu S** (2016) Rising competitive authoritarianism in Turkey. *Third World Quarterly* 37(9), 1581–1606. <https://doi.org/10.1080/01436597.2015.1135732>.
- Esen B and Gumuscu S** (2018) Building a competitive authoritarian regime: State–business relations in the AKP’s Turkey. *Journal of Balkan and Near Eastern Studies* 20(4), 349–372. <https://doi.org/10.1080/19448953.2018.1385924>.
- Farzin YH and Bond CA** (2006) Democracy and environmental quality. *Journal of Development Economics* 81(1), 213–235. <https://doi.org/10.1016/j.jdeveco.2005.04.003>.
- Fick SE and Hijmans RJ** (2017) WorldClim 2: new 1-km spatial resolution climate surfaces for global land areas. *International Journal of Climatology* 37(12), 4302–4315. <https://doi.org/10.1002/joc.5086>.
- Geist HJ and Lambin EF** (2002) Proximate causes and underlying driving forces of tropical deforestation: tropical forests are disappearing as the result of many pressures, both local and regional, acting in various combinations in different geographical locations. *BioScience* 52(2), 143–150. [https://doi.org/10.1641/0006-3568\(2002\)052\[0143:PCAUDF\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2002)052[0143:PCAUDF]2.0.CO;2).
- Global Forest Watch** (n.d.). Global forest watch. Accessed March 23, 2022. <https://www.globalforestwatch.org/dashboards/country/TUR>.
- Gül M, Zorlu K and Gül M** (2019) Assessment of mining impacts on environment in Muğla-Aydın (SW Turkey) using Landsat and Google Earth imagery. *Environmental Monitoring and Assessment*, 191(11), 1–18. <https://doi.org/10.1007/s10661-019-7807-3>.
- Günşen H and Atmıç E** (2019) Analysis of forest change and deforestation in Turkey. *International Forestry Review* 21(2), 182–194. <https://doi.org/10.1505/146554819826606577>.
- Gupta P, Christopher SA, Wang J, Gehrig R, Lee Y and Kumar N** (2006) Satellite remote sensing of particulate matter and air quality assessment over global cities. *Atmospheric Environment* 40(30), 5880–5892. <https://doi.org/10.1016/j.atmosenv.2006.03.016>.

- Gürakar-Çeviker E** (2016) *Politics of favoritism in public procurement in Turkey: reconfigurations of dependency networks in the AKP Era*. Springer.
- Gürakar-Çeviker E and Meyersson E** (2016) State discretion, political connections and public procurement: evidence from Turkey. Unpublished manuscript. Accessed January 29, 2023. <https://erikmeyersson.com/research/>.
- Guriev S and Treisman D** (2019) Informational autocrats. *Journal of Economic Perspectives* 33(4), 100–127. <https://doi.org/10.1257/jep.33.4.100>.
- Gurses, M** (2012). Environmental consequences of civil war: evidence from the Kurdish conflict in Turkey. *Civil Wars* 14(2), 254–271. <https://doi.org/10.1080/13698249.2012.679495>.
- Hansen MC, Potapov PV, Moore R, Hancher M, Turubanova SA, Tyukavina A, Thau D, Stehman SV, Goetz SJ, Loveland TR, Kommareddy A, Egorov A, Chini L, Justice CO and Townshend JRG** (2013). High-resolution global maps of 21st-century forest cover change. *Science* 342(6160), 850–853. <https://doi.org/10.1126/science.124469>.
- Henderson JV, Storeygard A and Weil DN** (2012) Measuring economic growth from outer space. *American Economic Review* 102(2), 994–1028. <https://doi.org/10.1257/aer.102.2.994>.
- Heper M and Keyman EF** (1998) Double-faced state: political patronage and the consolidation of democracy in Turkey. *Middle Eastern Studies* 34(4), 259–277. <https://www.jstor.org/stable/4283977>.
- Högbladh S** (2021). *UCDP GED Codebook version 21.1*. Department of Peace and Conflict Research, Uppsala University.
- Hu Y and Yao J** (2019) illuminating economic growth. International Monetary Fund Working Paper No. 2019/077. Accessed January 29, 2023. <https://www.imf.org/en/Publications/WP/Issues/2019/04/09/Illuminating-Economic-Growth-46670>.
- Iverson LR, Graham RL and Cook EA** (1989) Applications of satellite remote sensing to forested ecosystems. *Landscape Ecology* 3(2), 131–143. <https://doi.org/10.1007/BF00131175>.
- Karadag A** (2012) Changing environment and urban identity following open-cast mining and thermic power plant in Turkey: case of Soma. *Environmental Monitoring and Assessment* 184(3), 1617–1632. <https://doi.org/10.1007/s10661-011-2065-z>.
- Klopp JM** (2012) Deforestation and democratization: patronage, politics and forests in Kenya. *Journal of Eastern African Studies* 6(2), 351–370. <https://doi.org/10.1080/17531055.2012.669577>.
- Kropok J and Kubinec R** (2020) Interpretation and identification of within-unit and cross-sectional variation in panel data models. *PLoS One* 15(4), e0231349. <https://doi.org/10.1371/journal.pone.0231349>.
- Kuvan Y** (2010) Mass tourism development and deforestation in Turkey. *Anatolia* 21(1), 155–168. <https://doi.org/10.1080/13032917.2010.9687096>.
- Lemos MC and Agrawal A** (2006) Environmental governance. *Annual Review of Environment and Resources* 31, 297–325. <https://doi.org/10.1146/annurev.energy.31.042605.135621>.
- Levitsky S and Way LA** (2010) *Competitive Authoritarianism: Hybrid Regimes after the Cold War*. Cambridge University Press.
- Mill, JS** (2004 [1861]). *Considerations on Representative Government*. Accessed April 1, 2019. <https://www.gutenberg.org/files/5669/5669-h/5669-h.htm>.
- NASA** (2021). Active Fire Data. Accessed March 23, 2022. <https://earthdata.nasa.gov/earth-observation-data/near-real-time/firms/active-fire-data>.
- Orhan G** (2013) Yerel yönetimler ve küresel iklim değişikliği. In Bulut Y, Eren V, Karakaya S and Aydın A (eds), *Kuramdan Uygulamaya Yerel Yönetimler ve Kentsel Politikalar*. Pegem Akademi
- Özkaynak B, Turhan E and Aydın Cİ** (2020) The politics of energy in Turkey: running engines on geo-political, discursive, and coercive power. In Tezcür GM (ed), *The Oxford Handbook of Turkish Politics*. Oxford University Press.
- Pailler S** (2018) Re-election incentives and deforestation cycles in the Brazilian Amazon. *Journal of Environmental Economics and Management* 88, 345–365. <https://doi.org/10.1016/j.jeem.2018.01.008>.
- Paker H, Adaman F, Kadirbeyoğlu Z and Özkaynak B** (2013) Environmental organisations in Turkey: engaging the state and capital. *Environmental Politics* 22(5), 760–778. <https://doi.org/10.1080/09644016.2013.825138>.
- Pang M, Zhang L, Ulgiati S and Wang C** (2015) Ecological impacts of small hydropower in China: insights from an energy analysis of a case plant. *Energy Policy* 76, 112–122. <https://doi.org/10.1016/j.enpol.2014.10.009>.

- Persson T, Roland G and Tabellini G** (1997) Separation of powers and political accountability. *The Quarterly Journal of Economics* 112(4), 1163–1202. <https://www.jstor.org/stable/2951269>.
- Przeworski A, Alvarez ME, Cheibub JA and Limongi F** (2000) *Democracy and Development: Political Institutions and Well-Being in the World, 1950–1990*. Cambridge University Press.
- Ribot JC, Agrawal A and Larson AM** (2006) Recentralizing while decentralizing: how national governments reappropriate forest resources. *World Development* 34(11), 1864–1886. <https://doi.org/10.1016/j.worlddev.2005.11.020>.
- Ritchie JC, Zimba PV and Everitt JH** (2003) Remote sensing techniques to assess water quality. *Photogrammetric Engineering & Remote Sensing* 69(6), 695–704. <https://doi.org/10.14358/PERS.69.6.695>.
- Sanford L** (2021) Democratization, elections, and public goods: the evidence from deforestation. *American Journal of Political Science*. <https://doi.org/10.1111/ajps.12662>.
- Sayan RC** (2019) Exploring place-based approaches and energy justice: ecology, social movements, and hydropower in Turkey. *Energy Research & Social Science* 57, 101234. <https://doi.org/10.1016/j.erss.2019.101234>.
- Sayan RC and Kibaroglu A** (2016) Understanding water-society nexus: insights from Turkey's small-scale hydropower policy. *Water Policy* 18(5), 1286–1301. <https://doi.org/10.2166/wp.2016.235>.
- Sundberg R and Melander E** (2013) Introducing the UCDP georeferenced event dataset. *Journal of Peace Research* 50(4), 523–532. <https://doi.org/10.1177/0022343313484347>.
- Tolunay D** (2017) Dünyada ve Türkiye’de ormansızlaşma. In Kula OB and Durmuş Ş (eds), *Ormancılık Politikaları ve Orman Köylülerinin Durumu*. Cumhuriyet Halk Partisi Yayınları. Accessed January 29, 2023. <https://chp.org.tr/yayin/ormancilik-politikalari-ve-orman-koylulerinin-durumu>.
- Toprak D** (2017) Türkiye’nin çevre politikasında yerel yönetimlerin rolü: yerel yönetim bütçesinin incelenmesi. *Maliye Araştırmaları Dergisi* 3(2), 173–193. <https://dergipark.org.tr/tr/pub/finance/issue/61464/917903>.
- Turhan E, Mazlum SC, Şahin Ü, Şorman AH and Gündoğan AC** (2016). Beyond special circumstances: climate change policy in Turkey 1992–2015. *Wiley Interdisciplinary Reviews: Climate Change* 7(3), 448–460. <https://doi.org/10.1002/wcc.390>.
- Türkiye Cumhuriyeti İletişim Başkanlığı** (2019) Cumhurbaşkanı Erdoğan: “17 yılda toplam 4,5 milyar fidanı toprakla buluşturarak orman varlığımızı 20,8 milyon hektardan 22,6 Milyon hektara çıkardık.” Accessed March 23, 2022. <https://www.iletisim.gov.tr/turkce/haberler/detay/cumhurbaskani-erdogan-17-yilda-toplam-45-milyar-fidani-toprakla-bulusturarak-orman-varligimizi-208-milyon-hektardan-226-milyon-hektara-cikardik>.
- Türkiye Ormanlar Derneği** (2019). Türkiye Ormanlığı. Accessed March 23, 2022. https://www.ormancilardernegi.org/dosyalar/files/revize_rapor7%5C%20web.pdf.
- Ünker P** (2021) Yanan ormanlar turizme açılır mı? Accessed March 23, 2022. <https://www.dw.com/tr/yanan-ormanlar-turizme-acilir-mi/a%C3%A7%C4%B1%C4%B1r-m%C4%B1/a-58743611>.
- Van Etten J, Jongerden J, de Vos HJ, Klaasse A and van Hoesve EC** (2008) Environmental destruction as a counterinsurgency strategy in the Kurdistan region of Turkey. *Geoforum* 39(5), 1786–1797. <https://doi.org/10.1016/j.geoforum.2008.05.001>.
- World Tourism Organization** (2020) UNWTO World Tourism Barometer and Statistical Annex 18(7). World Tourism Organization, 1–36. <https://doi.org/10.18111/wtobarometereng>.
- Yucel DS and Baba A** (2013) Geochemical characterization of acid mine lakes in Northwest Turkey and their effect on the environment. *Archives of Environmental Contamination and Toxicology* 64(3), 357–376. <https://doi.org/10.1007/s00244-012-9843-7>.

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