# Introduction

Wildfires are vital for various ecosystem, such as savannahs and boreal forests. They have taken a critical role in development and sustainability for these ecosystems. While the main cause of natural ignition has been lighting (Komarek, 1964), for over the last millennium, fires are increasingly used and/or are indirectly ignited by humans. At first, the purposes of these fires were to modify specific areas, so human could prepare these regions for agricultural activity, domestic purposes, or were used as war strategies. These purposes have changed drastically for the last 300 years. Fires are being suppressed, so agricultural or industry rich areas are protected, or they are used a great expansion of farmland. The prevention cause an accumulation of fuel in fire sensitive climates, which could result in intense wild fires or the expansion of agricultural land reduces the surface area for fire vital ecological systems (Bowman *et al.*, 2011). The change in fire management resulted in a decline in the amount of global burned area over the last 18 years (Andela *et al.*, 2017).

While there is a reduction of burned area, the rise of the mean temperature on a global scale and climatological effects have influenced and are influencing the risk of the fires over the last century. They are also a part of the cause in changes in the fire seasons and fire regimes for various regional climates. These effects are caused by several greenhouse gases, such as methane and carbon dioxide, which are emitted by human activity. The effects of these greenhouse gasses is observed in various atmospheric and biochemical cycles (Hartmann *et al.*, 2013). This development can introduce fire regimes and fire seasons into currently low risk fire areas. The prediction is that climate change is going to make the duration of fire seasons longer, the frequency of fires increasing (Flannigan *et al.*, 2009) and the risk of the fire is going to be higher in the 21th century. The climatological effects could be amplified by the changes in the local landcover as a response to the warmer and drier climate (Liu, Stanturf and Goodrick, 2010).

These changes are going to impact the local population, environment, political stability in its surroundings and economic situation (Morton *et al.*, 2003; Ganteaume *et al.*, 2013). Various health issues related to respiratory systems are going to effect the local population for a short and/or long period of time (Reid *et al.*, 2016; Cascio, 2018). It results sometimes in rioting, habitat loss for wildlife and the severe damage on structures and properties in the region (Morton *et al.*, 2003; San-Miguel-Ayanz, Moreno and Camia, 2013).

In Europe, around 70% of the fires and 85% of the burned surface area are currently in the Mediterranean Region. While wildfires and the consequences have been extensively researched in the Mediterranean area (San-Miguel-Ayanz and Camia, 2010; Oliveira *et al.*, 2012; Ganteaume *et al.*, 2013), global change does not only effect Southern Europe. The risk of fire is predicted to increase in currently wetter climates in Western Europe. Therefore, it is important to get more insight about how these wildfires are burning, how these fire regimes have developed over the last decade and on which vegetation type these fires mostly have burned in an European country where fire is predominantly present.

The Netherlands is one of the effected countries in Western Europe, whereby an increasing risk of forest fires is predicted if the rise in temperature is going to continue over the 21th century (Lung *et al.*, 2013). The country has several unique spatial and population characteristics that could greatly impact how wildfires start and give insight into how policy and population are influence future wildfires. The spatial policy of this country has a rich history in spatial planning and in general water management. This lead in the 20th century to greatly improving the Dutch waterworks to protect cities and the various spatial policies to stimulate economic growth. These developments resulted in a highly fragmented landscape and high dense highway infrastructure (CBS, 2016)(Janssen-Jansen, 2016; De Mulder, 2019). Another characteristic of the Netherlands is that it has the highest population density per square kilometre in Europe with 513 people / km2 ‑(CBS, 2016). This could be related how population influences the fire regime in high density areas.

Besides the countries spatial policy, the European Union has partly impacted spatial zones with a policy named the Bird and Habitats directives. The directives indicate that several designated landscapes are chosen to preserve the European biodiversity. These areas can be found over the European Union and part of a network, which is called Natura 2000 network. The implementation of the Natura 2000 areas in the Netherlands was done by local and regional local instruments (Beunen, Van Assche and Duineveld, 2013) and has contributed to the development of the current Dutch fragmented landscape.

These characteristics can be highly effecting the current and future fire regimes of the Netherlands, because most forest fires are indirectly caused by human agents (Ganteaume *et al.*, 2013). Furthermore, the chance of fire is higher, when the natural is closer to human infrastructure (Oliveira *et al.*, 2012). Therefore, NATURA 2000 areas are interesting to observe, because fires can be doing the most ecological damage in these areas.

Spatial and temporal information about these fire regimes can be useful for spatial policy, human health, and biodiversity. Governmental institutes can use the temporal and spatial information about the current fire regime to prevent ecological damage and effected human health is reduced (Morton *et al.*, 2003; San-Miguel-Ayanz, Moreno and Camia, 2013). Furthermore, it can be used as a starting point on how the fires are influenced by the regional effects of climate change.

Our study is going to provide new insights about the temporal aspect of fires in heavily human influenced landscape, such as when the most fires are burning for the last decade and which years were most wildfires were burning. The spatial aspect is also researched with information in which natural areas were the fires burning, and what was the most effected land cover type by the fires. The combination of temporal and spatial information about these fires is going to give information about the simple question when, where and what the fires have burned.