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Environmental systems and societies
Standard level
Paper 1 – resource booklet

Friday 29 October 2021 (afternoon)

1 hour

Instructions to candidates

- Do not open this booklet until instructed to do so.
- This booklet contains all the resources to answer paper 1.

Figure 1(a): World map showing the location of the United Kingdom

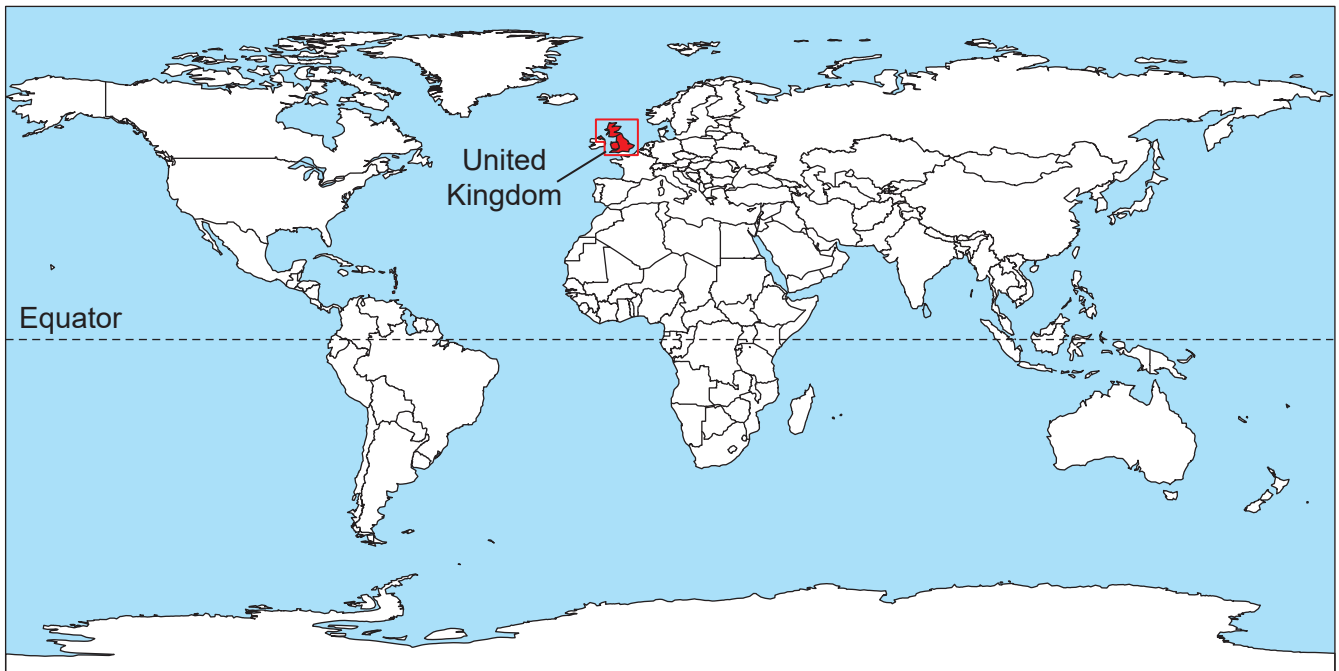


Figure 1(b): Map showing the location of London



Figure 1(c): An outline map of London

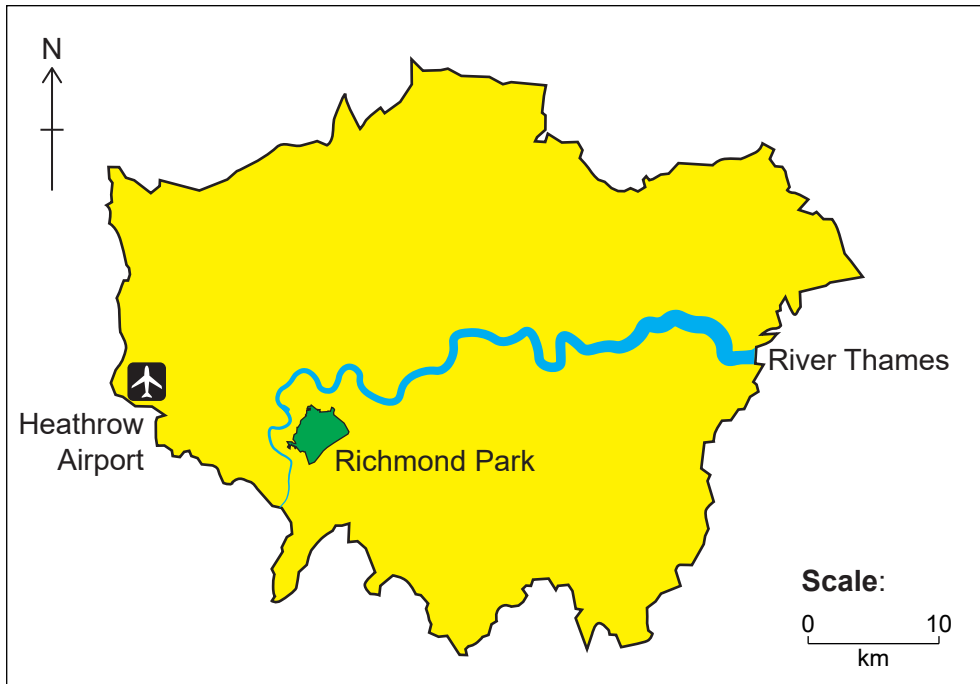


Figure 2(a): Fact file on London

- The largest city in England
- London generates 22% of the United Kingdom's economy
- Population of 8.9 million (2019)
- Natural increase rate was 1.13% per year (2011–2019)
- 37% of London's population are immigrants.
- Electricity is generated in power stations outside London.
- London aims to supply 15% of its energy by local, renewable sources by 2030.

Figure 2(b): Examples of ecosystems in London



Figure 3: Climate graph for London

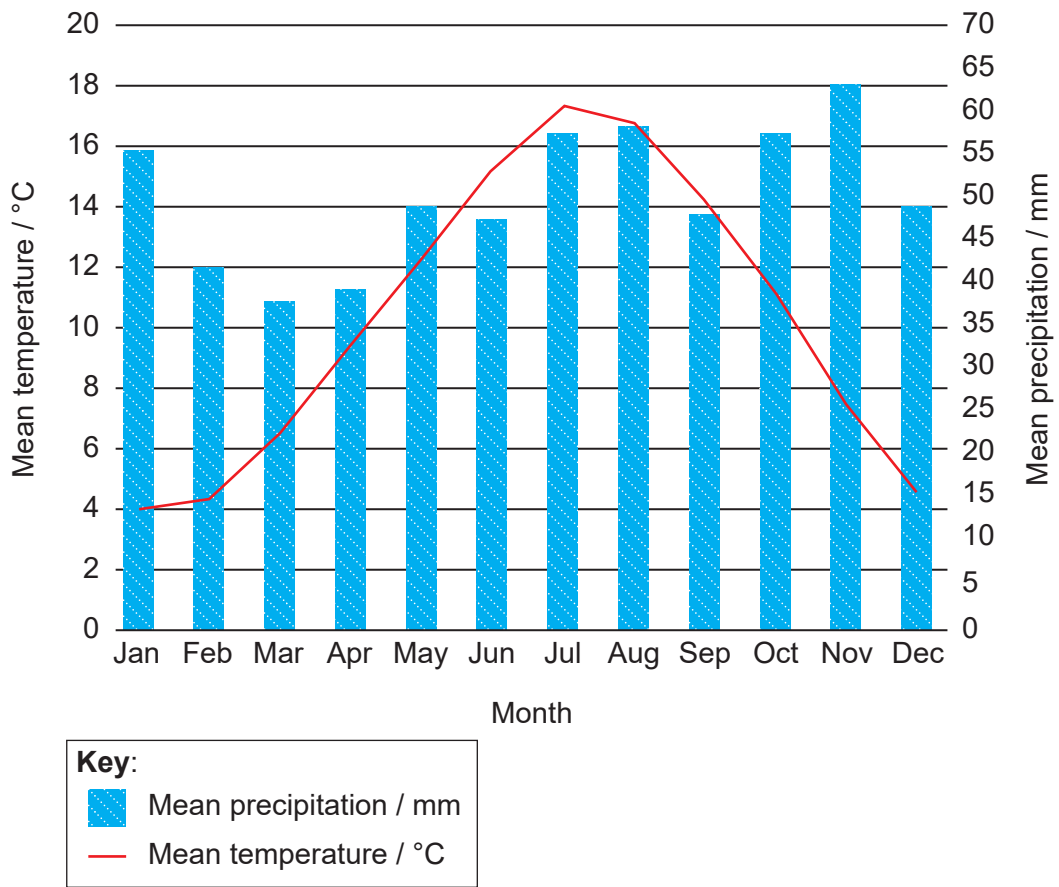


Figure 4(a): Green spaces in London

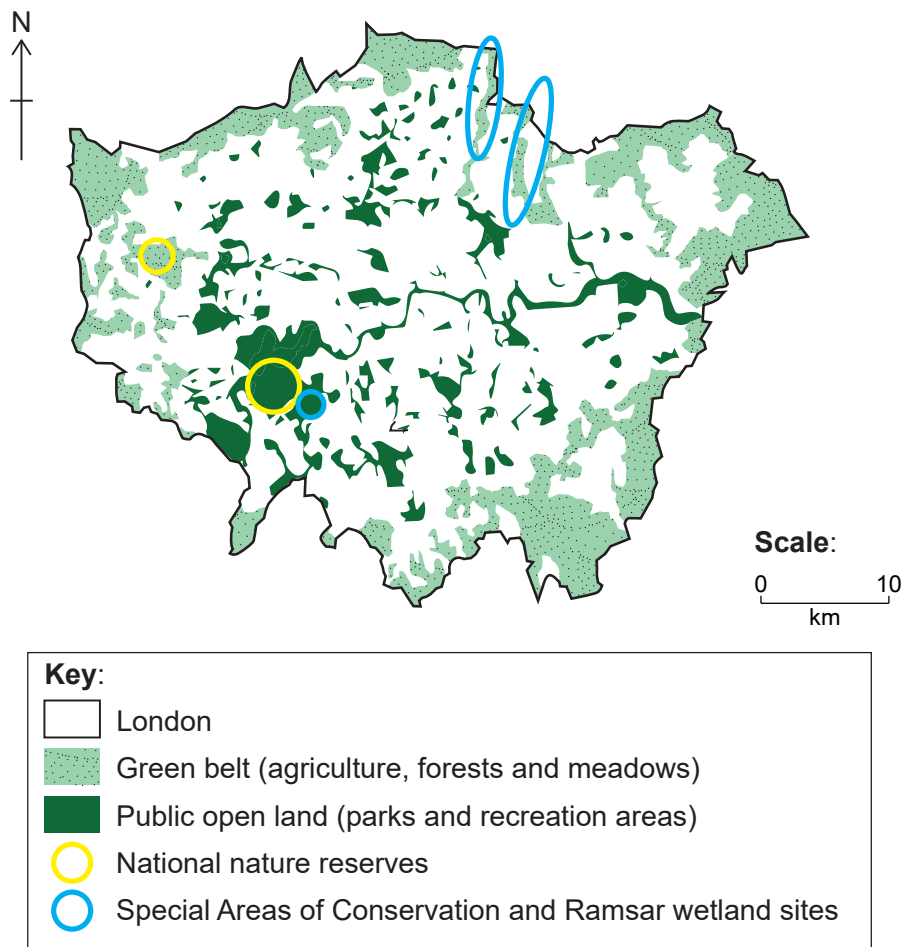


Figure 4(b): Fact file on London as a green city

- 47% of London is classified as green space.
 - 33% is natural habitat in public open spaces.
 - 14% is private domestic gardens.
- 2% is rivers, canals and reservoirs.
- It has over 8 million trees.
- It has two national nature reserves, three Special Areas of Conservation, 144 local nature reserves and 1602 Sites of Importance for Nature Conservation.
- Residential areas near a green space have higher economic value.

Figure 5: Fact file on deer species found in London




Reeves' muntjac (<i>Muntiacus reevesi</i>) (male)	 <ul style="list-style-type: none">• Native to Southeast Asia, introduced to UK when they escaped from a zoo• Lives throughout London• Eats grass, nuts and garden flowers• Breeds all year round• One of the smallest deer species; 0.44–0.52 m to shoulder
Red deer (<i>Cervus elaphus</i>) (male)	 <p>[Source: Luc Viatour / https://Lucnix.be]</p> <ul style="list-style-type: none">• Native to Europe, western Asia and northern Africa• Lives in Richmond Park• Eats grass and woody plants• Breeds once per year• One of the largest deer species; 1.00–1.20 m to shoulder
Fallow deer (<i>Dama dama</i>) (male)	 <ul style="list-style-type: none">• Native to Europe• Lives in Richmond Park• Eats grass and woody plants• Breeds once per year• Medium in size; 0.84–0.94 m to shoulder

Figure 6(a): Population of deer in Richmond Park, 2013-2017

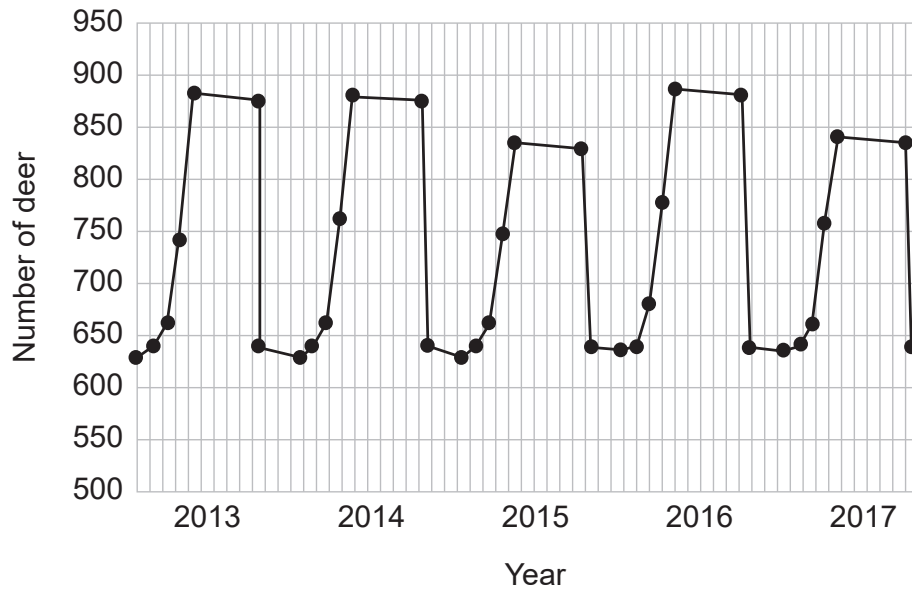


Figure 6(b): Number of deer removed from Richmond Park, 2013-2017

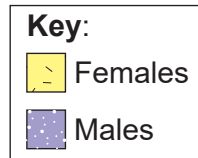
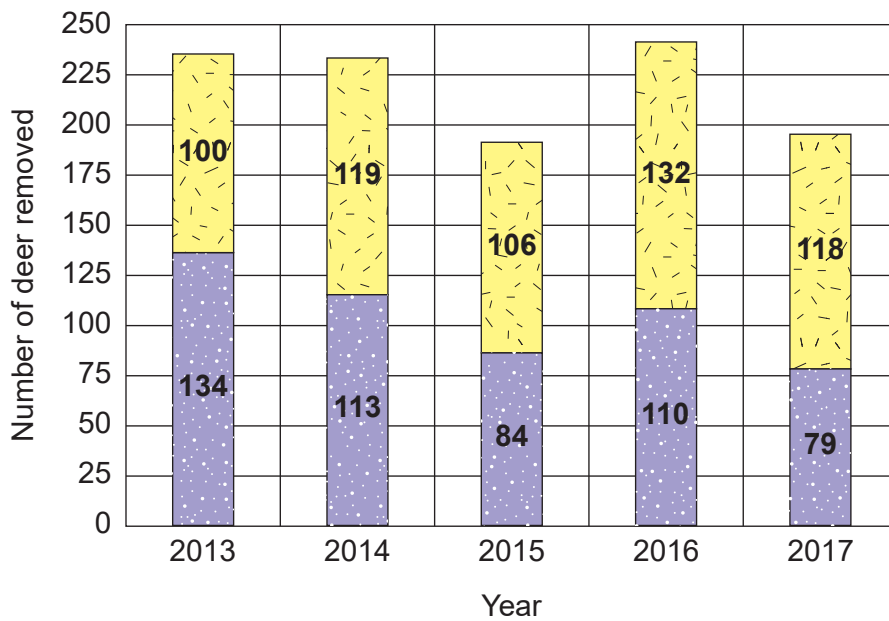


Figure 6(c): Fact file on Richmond Park

- Richmond Park is a national nature reserve and Special Area of Conservation.
- Approximately 630 red and fallow deer live permanently in the park.
- There are no natural predators for deer in Richmond Park.
- Deer numbers in the park are managed to maintain a sustainable population.
- Deer meat is sold and any profits are reinvested into caring for the deer.



Figure 7: Ecological footprints of London, the United Kingdom and the world, 2015

	London	United Kingdom	World average
Ecological footprint (global hectares per capita)	4.5	4.6	2.8
Biocapacity (global hectares per capita)	0.17	1.20	1.60

Biocapacity is the amount of biologically productive land available. It is a function of primary productivity.

Figure 8(a): Fact file on urban agriculture and vertical farms

- Approximately 9% of London’s land area is used for agriculture.
- Most commercial farms are on the edges of London, in the “green belt”.
- There is increasing interest in urban agriculture, such as vertical farming and rooftop gardening, including beekeeping.

Vertical farms:

- Vertical farms exist underground and inside empty industrial buildings.
- They produce vegetables such as salad leaves, lettuce, spinach and herbs.
- Compared to traditional UK agriculture, vertical farms use up to 70% less water and no pesticides.

Urban beekeeping:

- There are over 1000 beekeepers in London.
- There is a higher density of bees in London than in rural areas of the UK.
- London’s bees have more diverse food sources and are healthier than rural bees.
- An 11 km “bee corridor” of wildflowers has been created in north London.

Figure 8(b): Underground vertical farm



Figure 8(c): Rooftop beekeeping



Figure 9: Annual mean oxides of nitrogen (NO_x) concentrations measured in London air, 2016

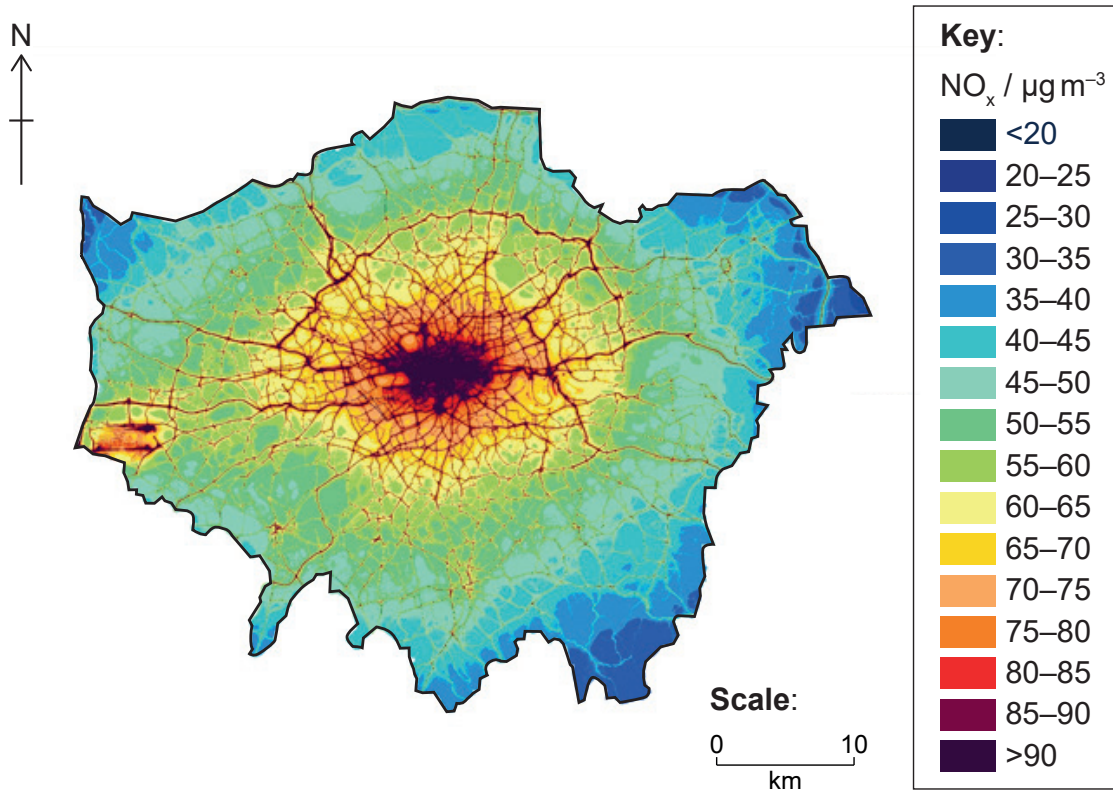


Figure 10(a): Recycling rates in London and England, 2000–2015

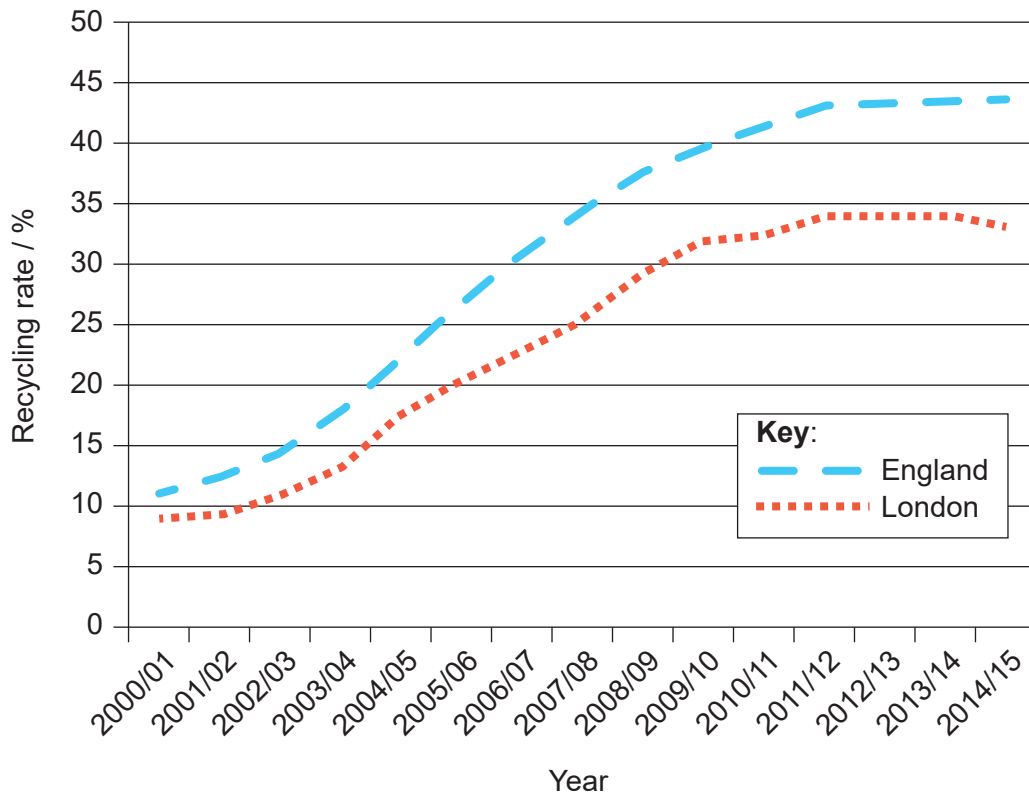


Figure 10(b): Proportions of material recycled in London, 2006

Material	Proportion recycled / %
Plastic	10
Paper	57
Aluminium cans	33
Steel cans	45
Glass	51

References:

- Figure 2(b)** (top left) O'Connor, P., 2015. GOC Walthamstow to Stratford 164: Old English Garden, Victoria Park. [image online] Available at: <https://www.flickr.com/photos/anemoneprojectors/25609419345/in/photostream/> Attribution-ShareAlike 2.0 Generic (CC BY-SA 2.0) <https://creativecommons.org/licenses/by-sa/2.0/> [Accessed 22 May 2020]. Source adapted.
- (top right) Taylor, J., 2009. Park Crescent, London NW1 private communal garden. [image online] Available at: https://fr.m.wikipedia.org/wiki/Fichier:Park_Crescent,_London_NW1_private_communal_garden_-_geograph.org.uk_-_1268358.jpg Attribution-ShareAlike 2.0 Generic (CC BY-SA 2.0) <https://creativecommons.org/licenses/by-sa/2.0/> [Accessed 22 May 2020]. Source adapted.
- (bottom left) Haywood, Jay., 2004. Grey Heron in London Wetlands Centre. [image online] Available at: https://commons.wikimedia.org/wiki/File:Grey_Heron_in_London_Wetlands_Centre_-_geograph.org.uk_-_795424.jpg Attribution-ShareAlike 2.0 Generic (CC BY-SA 2.0) <https://creativecommons.org/licenses/by-sa/2.0/> [Accessed 22 May 2020]. Source adapted.
- (center left and right) Oberst, T., 2019 Untitled. [photograph].
- Figure 4(a)** Greater London Authority, 2016. *Draft Economic Evidence Base 2016*. [online] Available at: <https://www.london.gov.uk/sites/default/files/draft-eeb-2016.pdf> [Accessed 1 June 2020].
- Figure 4(b)** Greenspace Information for Greater London (GiGL) CIC, 2019. www.gigl.org.uk/keyfigures/#.
- Figure 5** Nilfanion, 2010. Muntjac deer at Dumbleton Hall. [image online] Available at: https://fr.wikipedia.org/wiki/Fichier:Muntjac_deer_at_Dumbleton_Hall.jpg Attribution-ShareAlike 3.0 Unported (CC BY-SA 3.0) <https://creativecommons.org/licenses/by-sa/3.0/deed.en> [Accessed 22 May 2020]. Source adapted.
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- Manfred Antranias Zimmer /Pixabay.com, 2018. Striking Fallow Deer Buck, boasting an impressive rack. [online] Available at: <https://pixabay.com/photos/antler-fallow-deer-deer-dama-dama-899123/> [Accessed 13 September 2021].
- Figure 6(c)** The Royal Parks, 2020. Deer in Richmond Park. [online] Available at: <https://www.royalparks.org.uk/parks/richmond-park/richmond-park-attractions/wildlife/deer-in-richmond-park> [Accessed 1 September 2020].
- Oberst, T., 2019. Untitled. [photograph].
- Figure 8(b)** LouisHiemstra / www.istockphoto.com.
- Figure 8(c)** Permission from Berkeley Homes.
- Figure 9** Greater London Authority (GLA) <https://data.london.gov.uk/dataset/london-atmospheric-emissions-inventory--laei--2016>.
- Figure 10(a)** Greater London Authority, 2016. *Draft Economic Evidence Base 2016*. [online] Available at: <https://www.london.gov.uk/sites/default/files/draft-eeb-2016.pdf> [Accessed 1 June 2020].