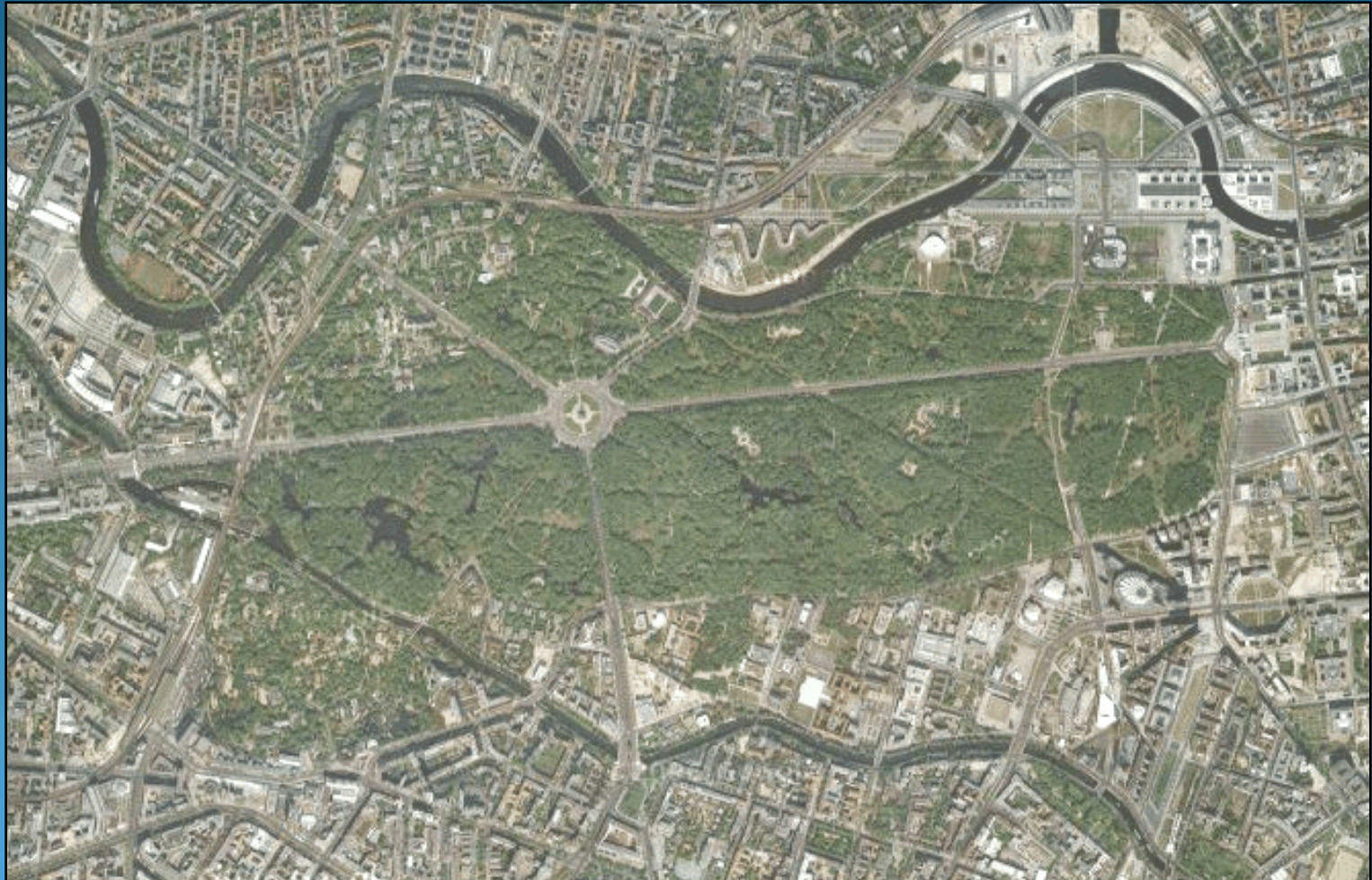


Urban forests, the great unknown. The case of Tiergarten in Berlin, Germany.

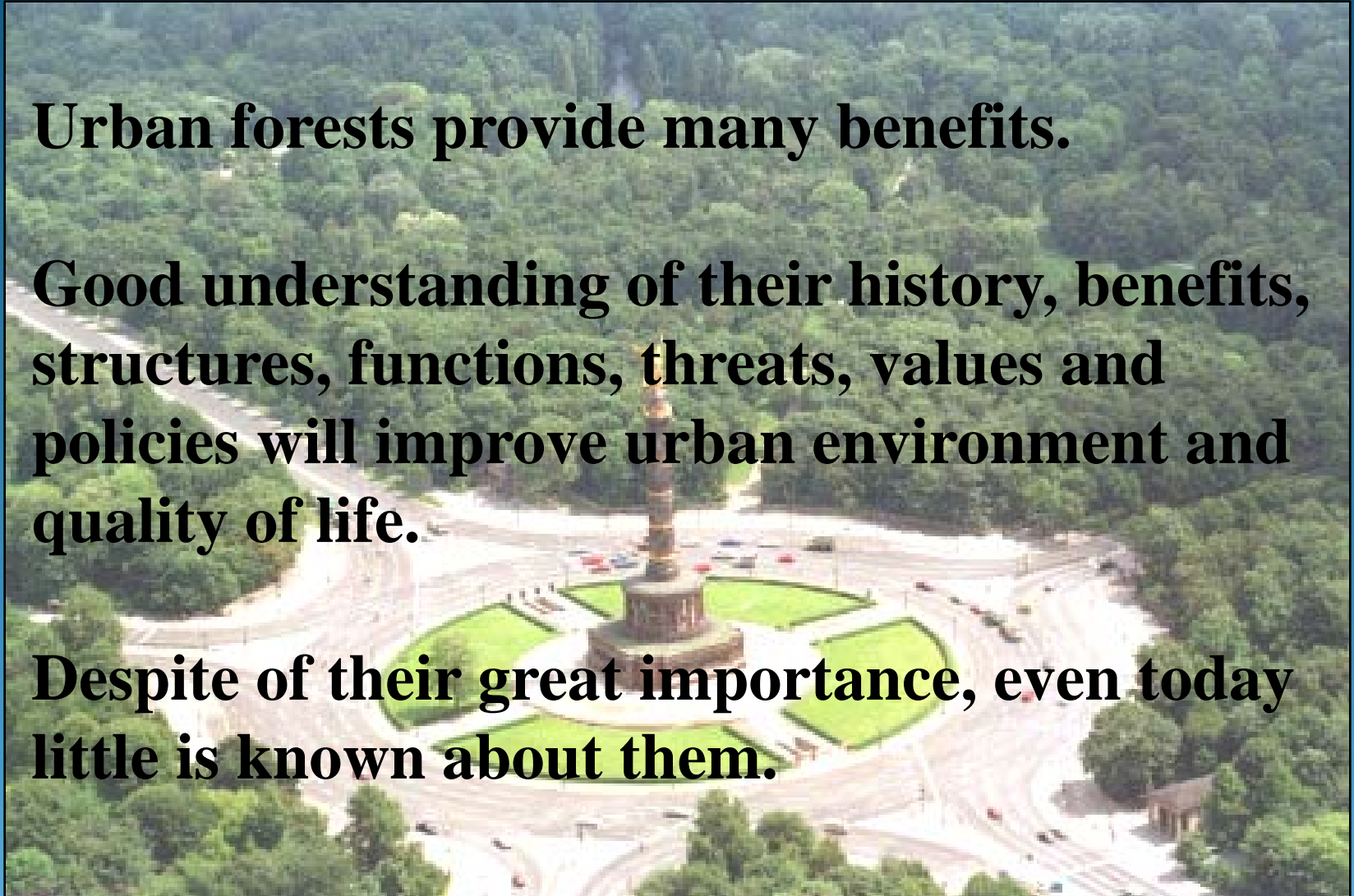


❑ Introduction

Urban forests provide many benefits.

Good understanding of their history, benefits, structures, functions, threats, values and policies will improve urban environment and quality of life.

Despite of their great importance, even today little is known about them.

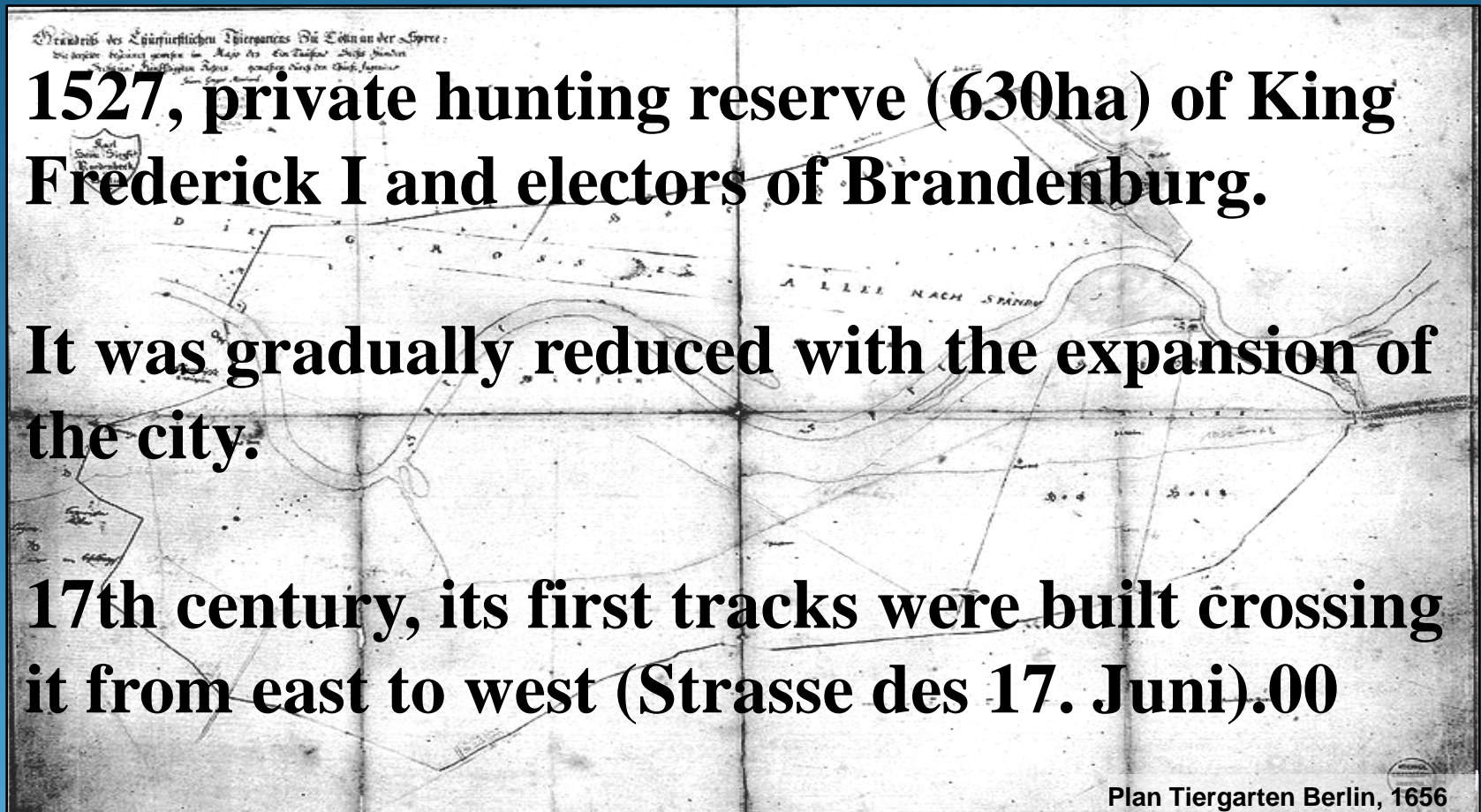



❑ Historical evolution

1527, private hunting reserve (630ha) of King Frederick I and electors of Brandenburg.

It was gradually reduced with the expansion of the city.

17th century, its first tracks were built crossing it from east to west (Strasse des 17. Juni).00



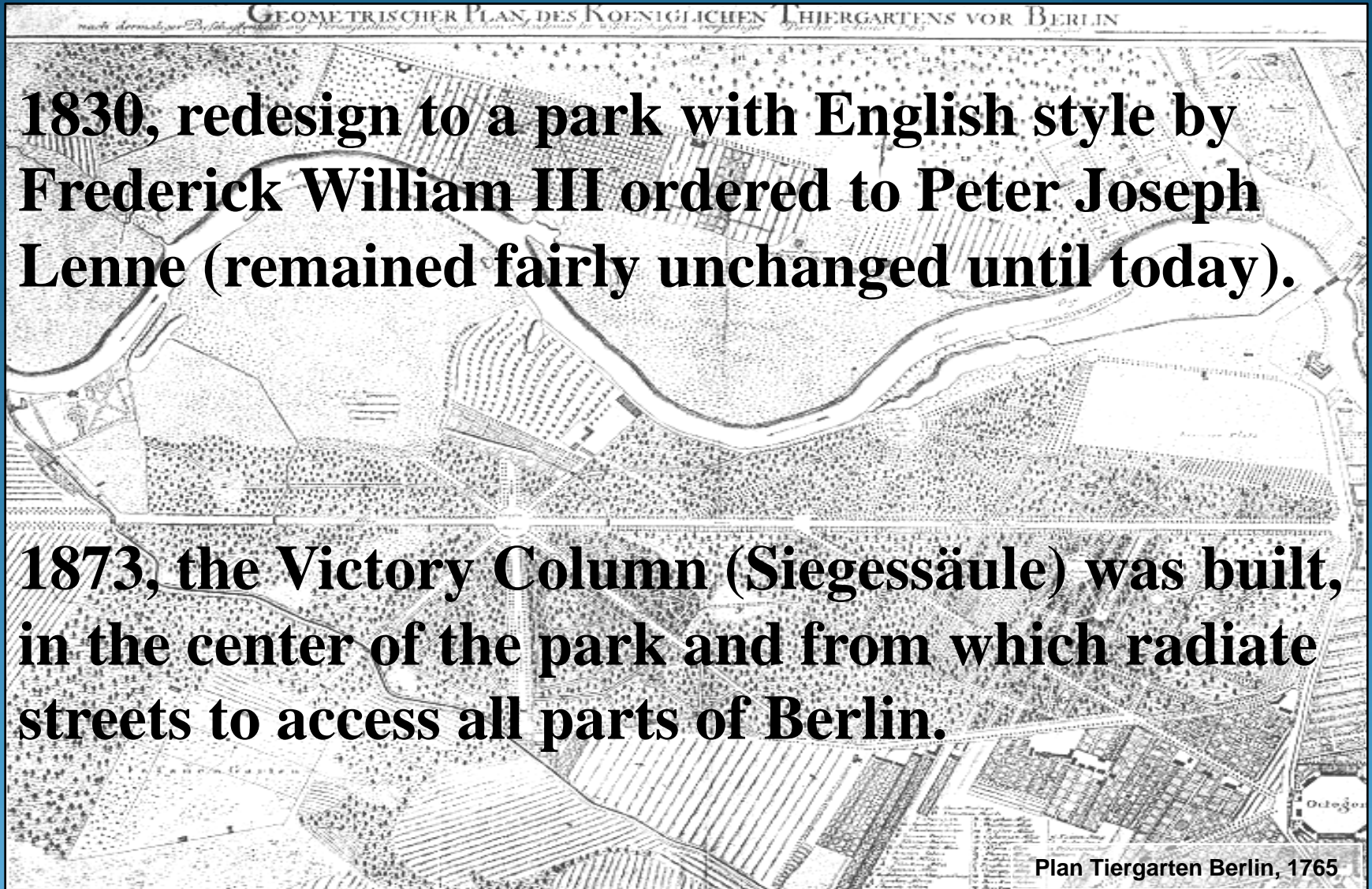
A historical map of the Tiergarten in Berlin, dated 1698. The map shows a large, irregularly shaped park area with various features like paths, buildings, and open spaces. The map is drawn in a detailed, hand-drawn style with fine lines and shading. The text is overlaid on the map.

1742, beginning of transformations to a public park with baroque style by Frederick II ordered to Georg von Wenceslao Knobelsdorff.

Fountains and small open spaces equipped with street furniture were adding.

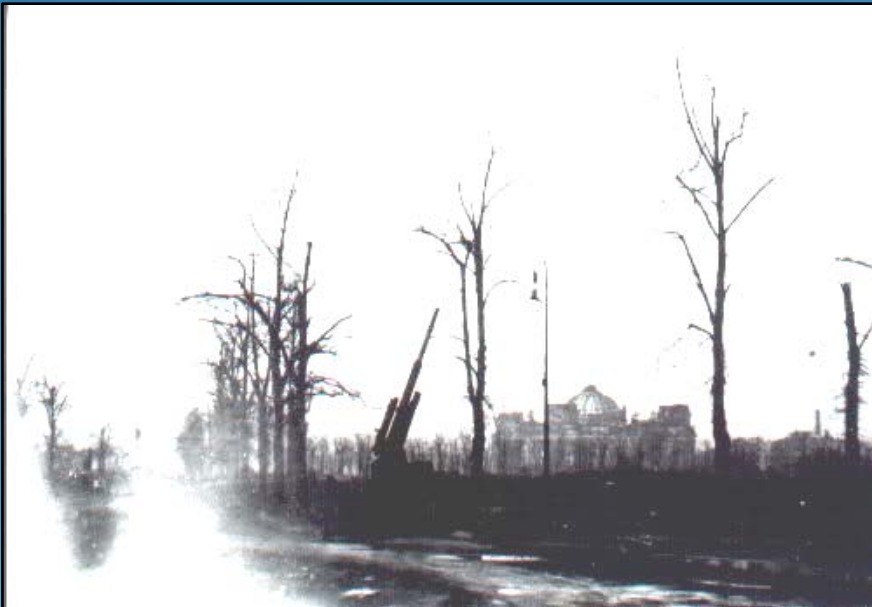
1830, redesign to a park with English style by Frederick William III ordered to Peter Joseph Lenne (remained fairly unchanged until today).

1873, the Victory Column (Siegessäule) was built, in the center of the park and from which radiate streets to access all parts of Berlin.



Plan Tiergarten Berlin, 1765

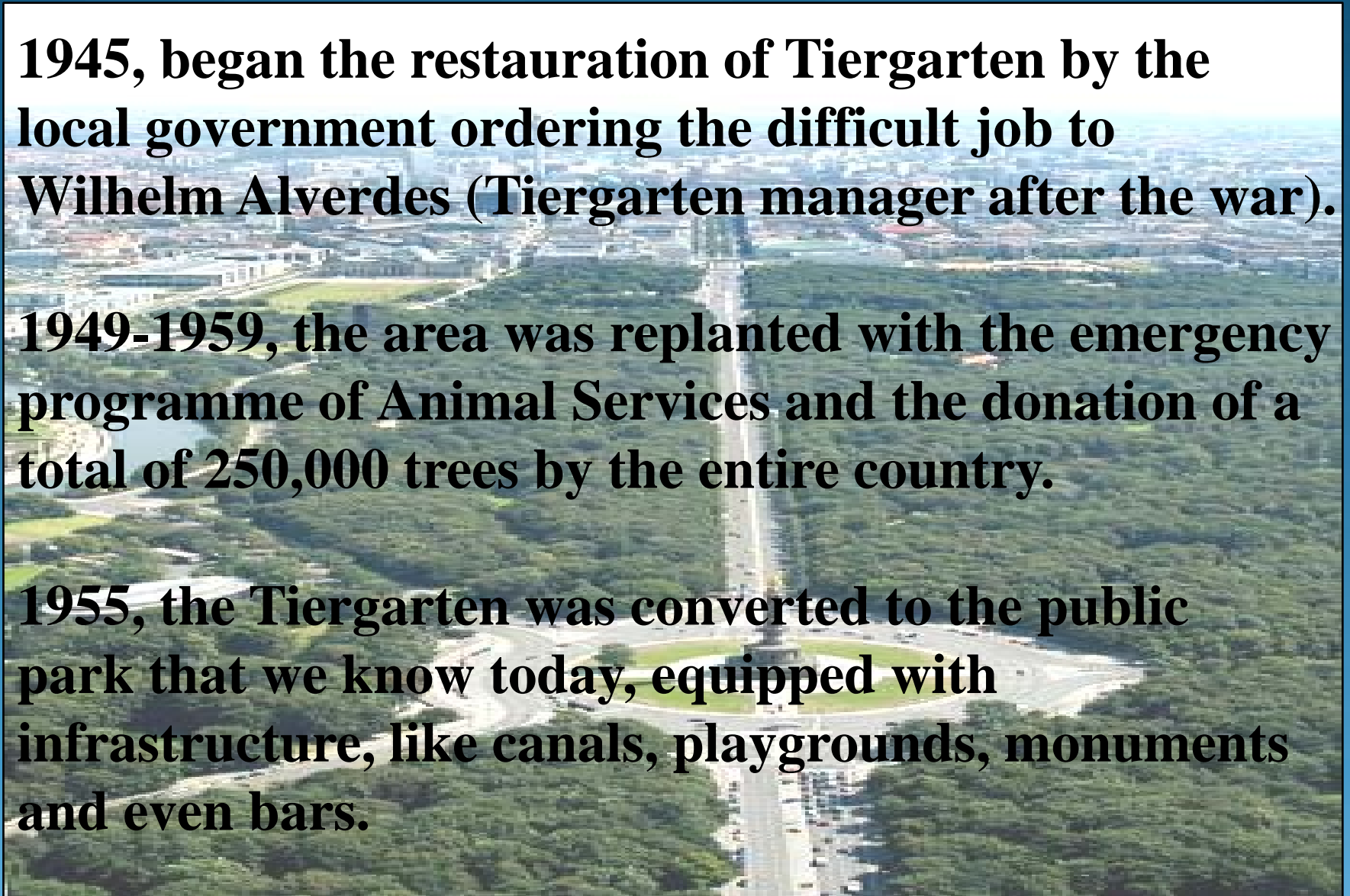
World War II, much of the forest was destroyed and from the 200,000 trees originally only a few hundred survived. Also, Berliners cut the remaining trees to use the firewood as fuel.



1945, began the restauration of Tiergarten by the local government ordering the difficult job to Wilhelm Alverdes (Tiergarten manager after the war).

1949-1959, the area was replanted with the emergency programme of Animal Services and the donation of a total of 250,000 trees by the entire country.

1955, the Tiergarten was converted to the public park that we know today, equipped with infrastructure, like canals, playgrounds, monuments and even bars.



An aerial photograph of the Tiergarten park in Berlin, Germany. The park is a large green area situated between the city center and the Spree river. The river flows through the park, creating a winding path. The surrounding urban area is visible, with buildings and roads. The park itself is mostly green with some paths and small structures.

Nowadays, the Tiergarten with 210ha it is the second largest and oldest urban park in Berlin.

In Germany, it is the 3th largest after the English Garden in Munich (417ha).

In the world, together with London's Hyde Park (141ha) and New York's Central Park (341ha), it is one of the largest urban parks .

The Tiergarten is a meeting place and recreation, where inactivity and activity is often mixed.

It is considered as a green oasis in a big city and, the green lung of the German capital.



❑ Forest structure

Formed by the remaining original vegetation and planted vegetation, including the spontaneous vegetation.

The combination of the vegetative composition, its distribution and its great diversity of species creates an impression of open countryside.



Vertical layers structure

- **Forest floor, consists of shed vegetative parts and non-vascular plants.**
- **Herb layer, dominated by shade-tolerant species.**
- **Shrub layer, characterized by woody vegetation relatively close to the ground.**
- **Underwood, consisting of small trees.**
- **Canopy, layer of meeting of the most crowns trees.**
- **Emerging trees, whose crowns emerge above the canopy.**

The general structure is composed of over 50 different species of trees, which 5 most common species are:

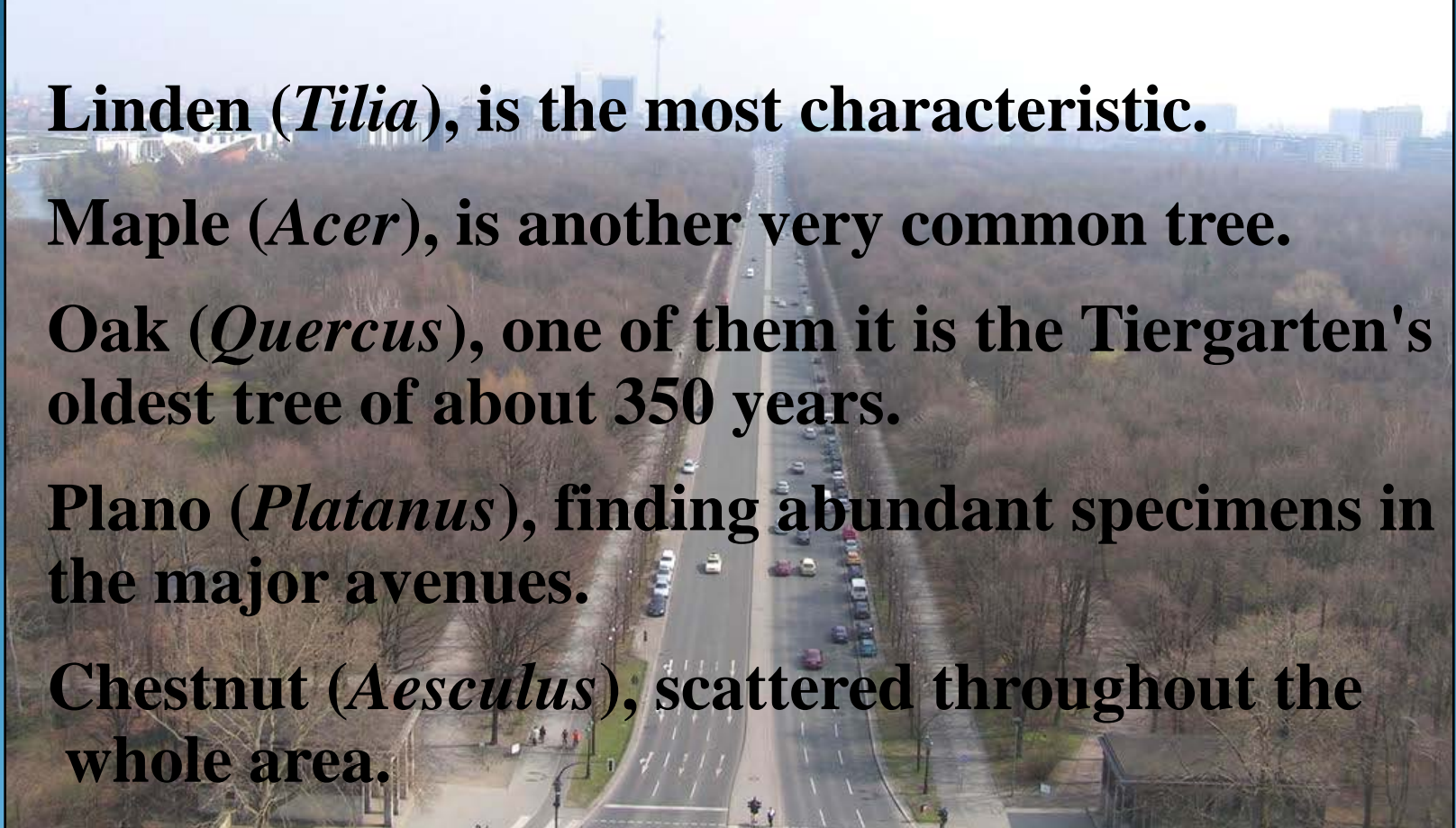
Linden (*Tilia*), is the most characteristic.

Maple (*Acer*), is another very common tree.

Oak (*Quercus*), one of them it is the Tiergarten's oldest tree of about 350 years.

Plano (*Platanus*), finding abundant specimens in the major avenues.

Chestnut (*Aesculus*), scattered throughout the whole area.



□ Importance as an urban forest

Contain a rich biodiversity.

Main habitats of plants and urban animals.

Important ecological compensation functions.

Not produce ecological impacts.

*** 12.5 square meters per inhabitant ensure good quality of life (World Health Organization).**



❑ Functions and values

Oriented towards human purposes.

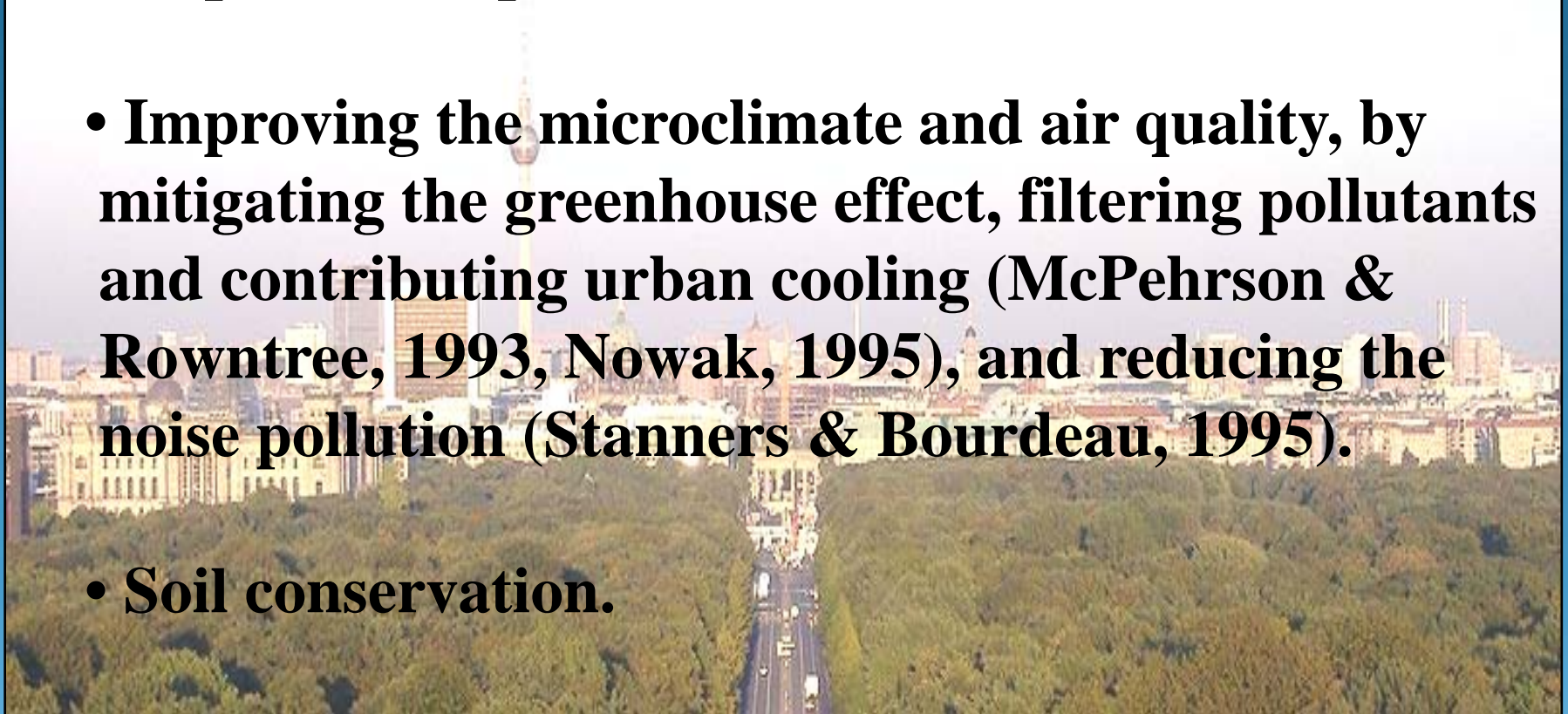
Tangibles:

- **Food (from hunting, from gardens, from trees).**
- **Firewood.**



Intangibles:

- **Health benefits (for mental and physical health (Kaplan & Kaplan, 1989)).**
- **Improving the microclimate and air quality, by mitigating the greenhouse effect, filtering pollutants and contributing urban cooling (McPehrson & Rowntree, 1993, Nowak, 1995), and reducing the noise pollution (Stanners & Bourdeau, 1995).**
- **Soil conservation.**



- 
- An aerial photograph showing a dense forest with trees in various shades of green, yellow, and orange, indicating autumn. In the background, a city skyline with several tall buildings is visible under a hazy sky. The image is framed by a blue border with wavy lines at the top.
- **Use, reuse and water conservation.**
 - **Solid waste and land regeneration.**
 - **Decongesting surrounding areas.**
 - **Recreational activities.**
 - **Education.**
 - **Employment.**
 - **Sense of community and enhancing the value of real estate property.**


□ Threats

- **Urban sprawl.**
- **Habitat fragmentation.**
- **Over-exploitation of resources.**
- **Pollution (acid rain).**
- **Climate changes.**
- **Vandalism.**
- **Invasion of exotic species.**

* Many threats exist for green urban areas (Green Book, European Community Commission, 1990).



□ Bodies of protection

A photograph showing a person's hands holding a small, young tree with green leaves. The background is a bright, sunny outdoor scene with a green field and a clear sky. The text is overlaid on the image.

Principal objective is the improvement of the quality of life of the urban population.

German legislation regulates green urban areas defined legally binding.

Nature protection in Berlin based on:

- **Federal Nature Conservation Act (BNatSchG), which defines objectives and fundamentals of environmental protection and landscape conservation.**
- **Federal Regulation for the Protection of Species (BArtSchV).**



Main bodies of protection

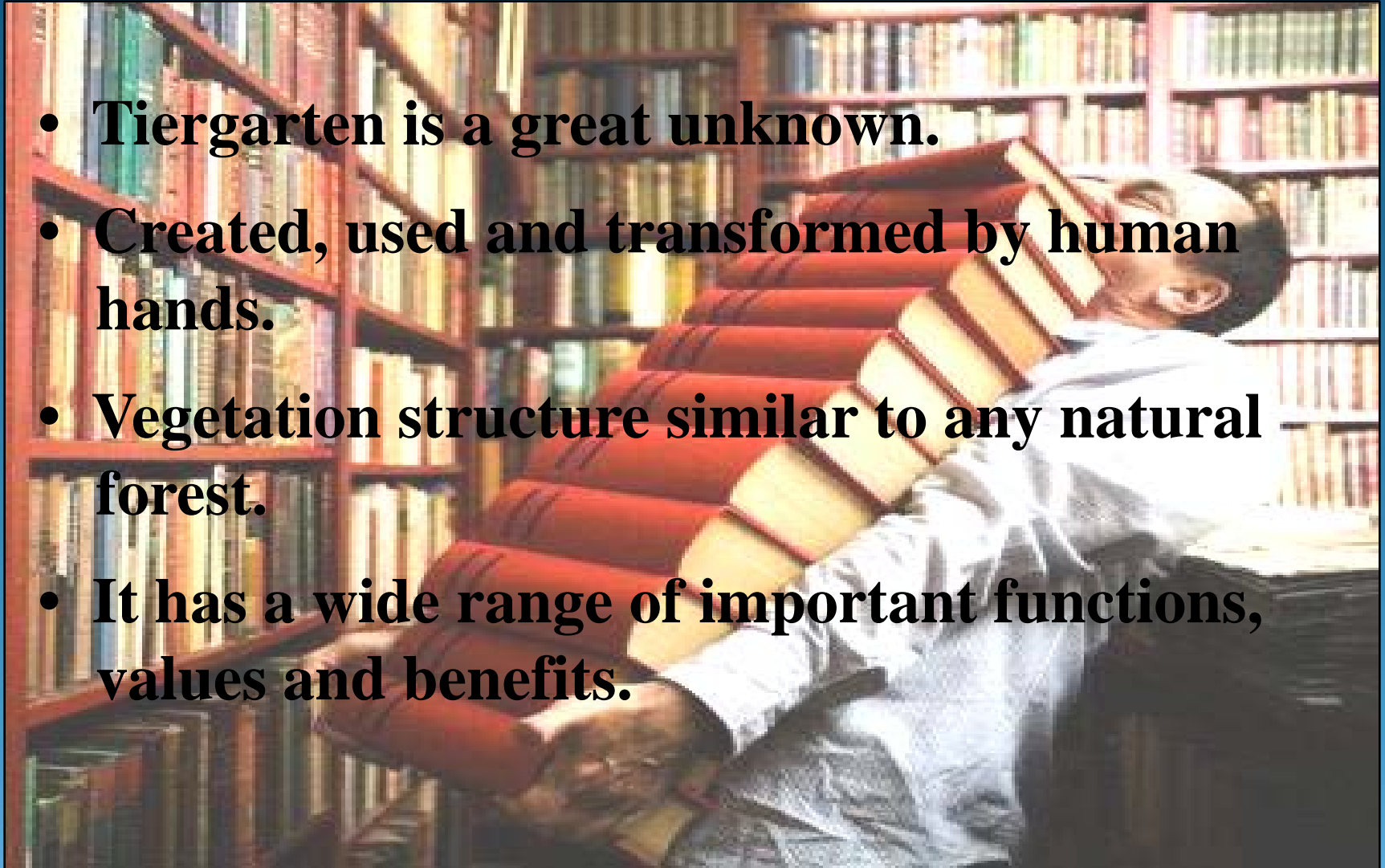
- **Law of Protection of Nature in Berlin (Berliner Naturschutzgesetz).**
- **Programme of the Landscape and of Protection of the Species (Landschaftsprogramm "LaPro").**
- **Conservation Law of Berlin, protecting habitats, natural monuments and conservating ecosystem.**
- **Flore Protection Plan of Berlin, protecting the diversity of plant species.**

International agreements

- **Washington Convention/(CITES), protecting the non-threaten of wildlife species in international trade.**
 - **Berne Convention of 1979, protecting wildlife species and their habitats.**
 - **Agenda 21, sustainable development.**
 - **European Network Natura 2000, maintaining the favourable condition of the habitat types and species composition.**
- 
- A pair of hands, one from the top and one from the bottom, are gently holding a small, translucent globe of the Earth. The globe shows green continents and blue oceans. The background is white, and the entire scene is framed by a blue border with wavy lines at the top and bottom.

❑ Discussion and conclusion

- **Tiergarten is a great unknown.**
- **Created, used and transformed by human hands.**
- **Vegetation structure similar to any natural forest.**
- **It has a wide range of important functions, values and benefits.**

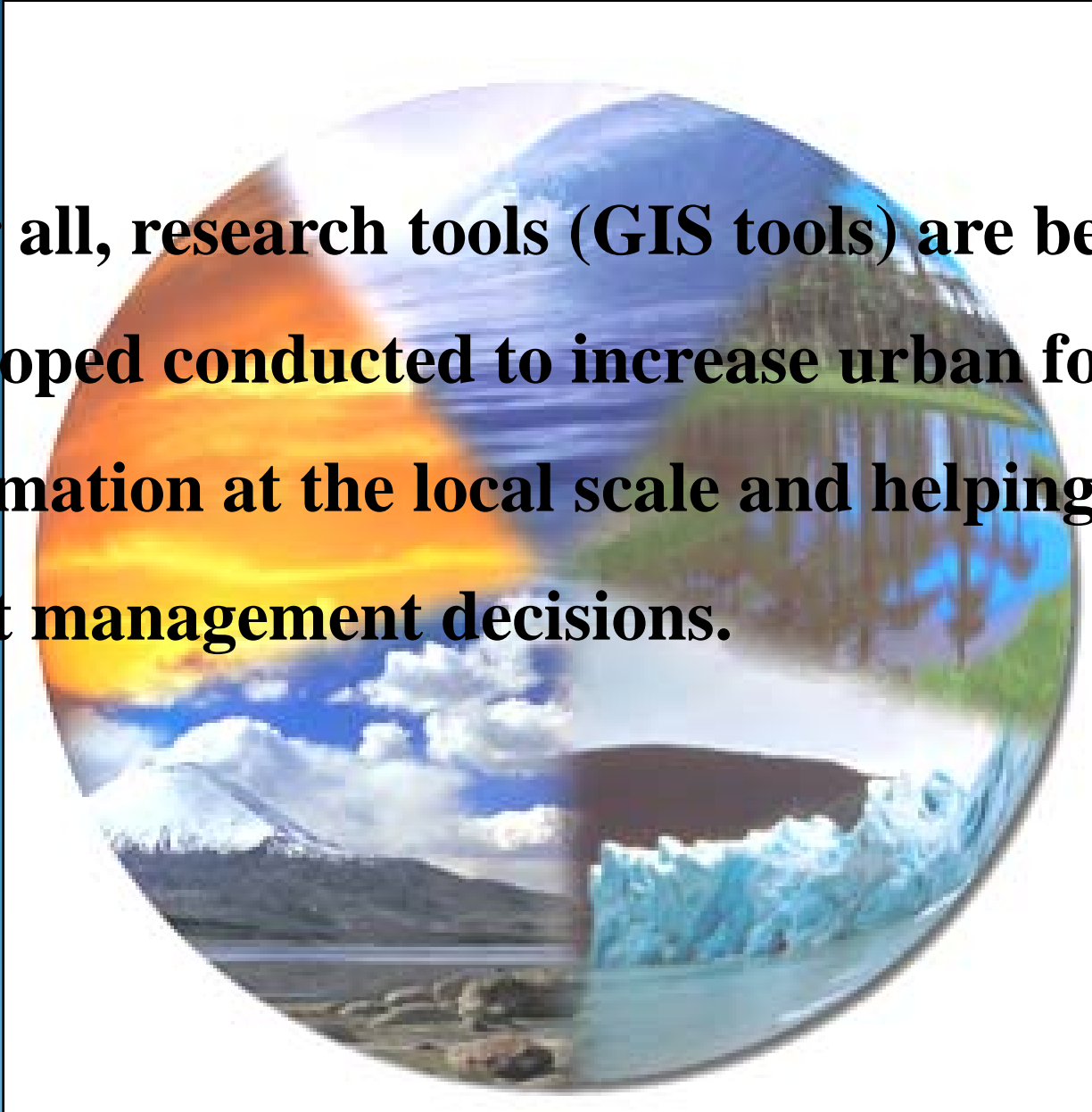


- 
- **It has a vital importance in terms of biodiversity.**
 - **There are none specific plans for the Tiergarten.**
 - **Many plans difficult a suitable application.**
 - **Further studies are needed.**

- **Lack of knowledge.**
- **Lack of data, information and documentation.**
- **Lack of guiding models for biodiversity planning.**
- **Lack of forestry techniques.**



After all, research tools (GIS tools) are being developed conducted to increase urban forest information at the local scale and helping urban forest management decisions.



GIS software CITYgreen, which is an ArcView application, developed by Environmental Systems Research Institute, Inc. (ESRI).

Produce

- **Air Pollution Removal Model**
- **Carbon Storage Model**
- **Carbon Sequestration Model**
- **Stormwater Runoff Model**
- **Water Quality Model**
- **Tree Growth Model**
- **Summer Energy Savings Model**
- **Tree Attribute Table**
- **Alternate Scenario Model**
- **Landcover Breakdown**

Used by urban foresters, planners, developers and citizens.

The main use is to analyze urban ecosystems and to make better environmental and economical decisions.

Therefore, the application of IT tools is useful to successfully implement urban forestry goals in future urban development.



THANK YOU FOR LISTENING!



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