



# Principles of the STRUCTURE of the PARK STANDS for the needs of high RECREATIONAL COMFORT while maintaining the BIODIVERSITY of the area

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## Goals

Principal goals of **park tree-stands management**:

- shaping and maintaining for widely defined **recreational purposes**
- maintaining **biodiversity** of site



A balanced approach to meeting this **principal function - recreation** - while simultaneously **maintaining biodiversity** results in formation a desirable **recreational bioclimate** of park's stand - both inside but also in surrounding areas

# Recreation in parks among trees

Central Park (New York)





## Recreation in parks among trees

Pole Mokotowskie park (Warsaw)

Warsaw:

the first sunny and warm weekend of April this year!

People gathering on park's lawns „catching sun rays”



## Park's recreational bioclimate

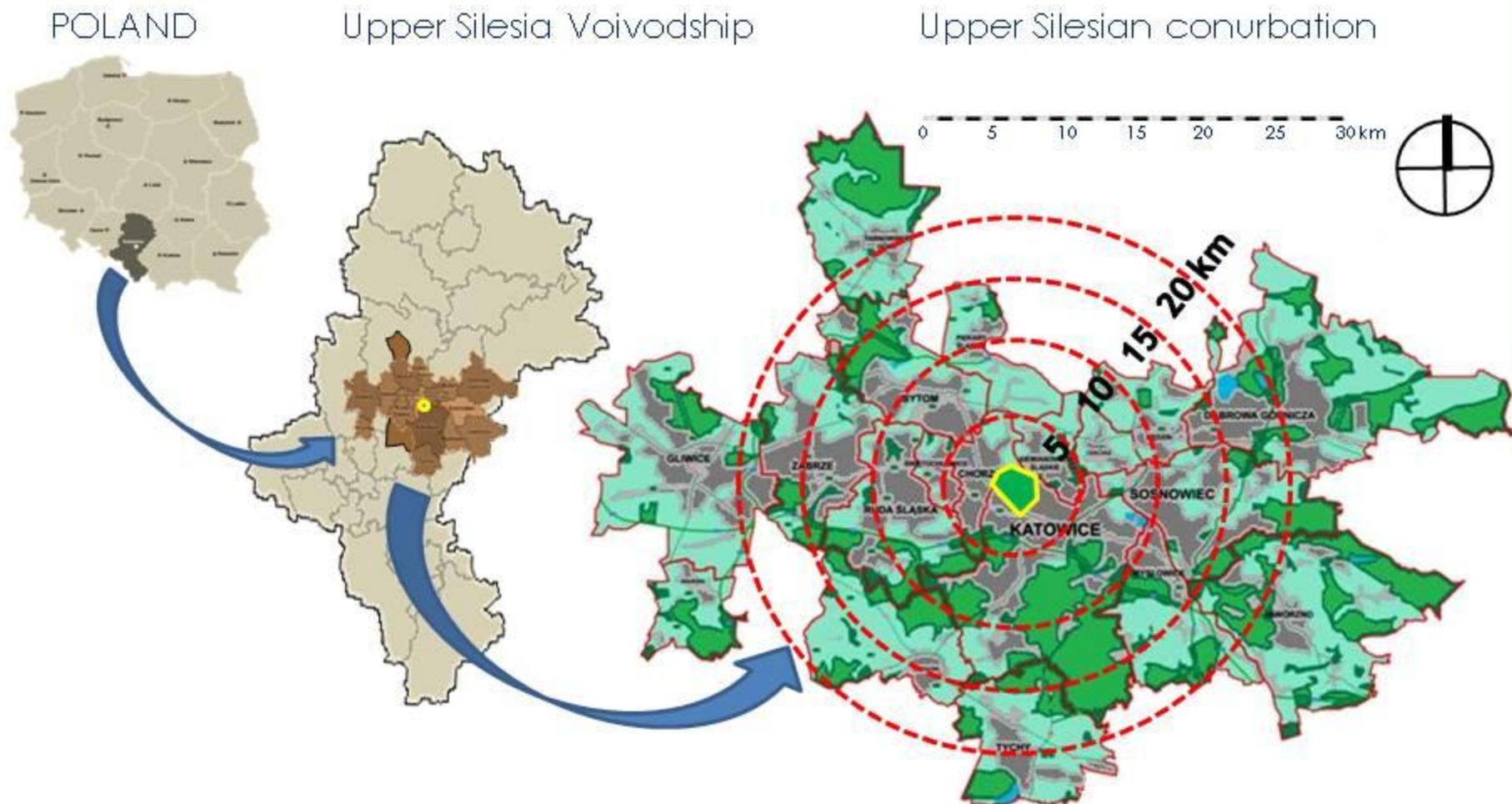
The **recreational bioclimate** is a sum of all **natural variables** the effect of which can be seen in air zone ("recreational layer") with a depth of ca. 2.0 m above ground level which is used for recreation:

- ❑ aeration (eg. air movement, air moisture and others)
- ❑ lightning conditions (eg. sunlight exposition)
- ❑ thermal conditions (eg. air temperature → thermal comfort)



## Silesia Park – case study

Gen. George Ziętek Voivodship Park of Culture and Recreation in Chorzów



## Silesia Park – basic data

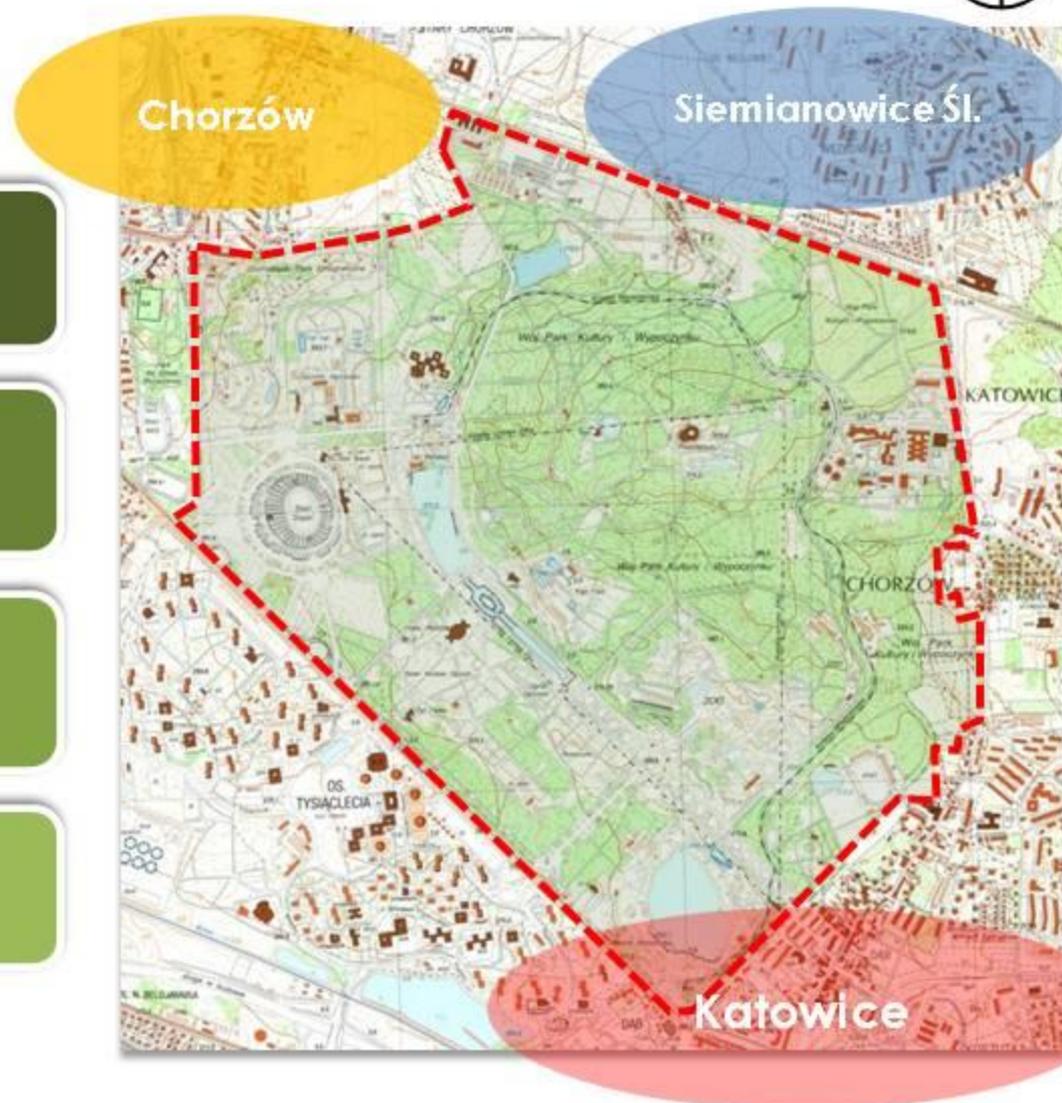
Design and construction: 1950-1968

Authors: prof. arch. W. Niemirski with a team, SGGW, Warsaw

Size of the park – ca. 600 ha

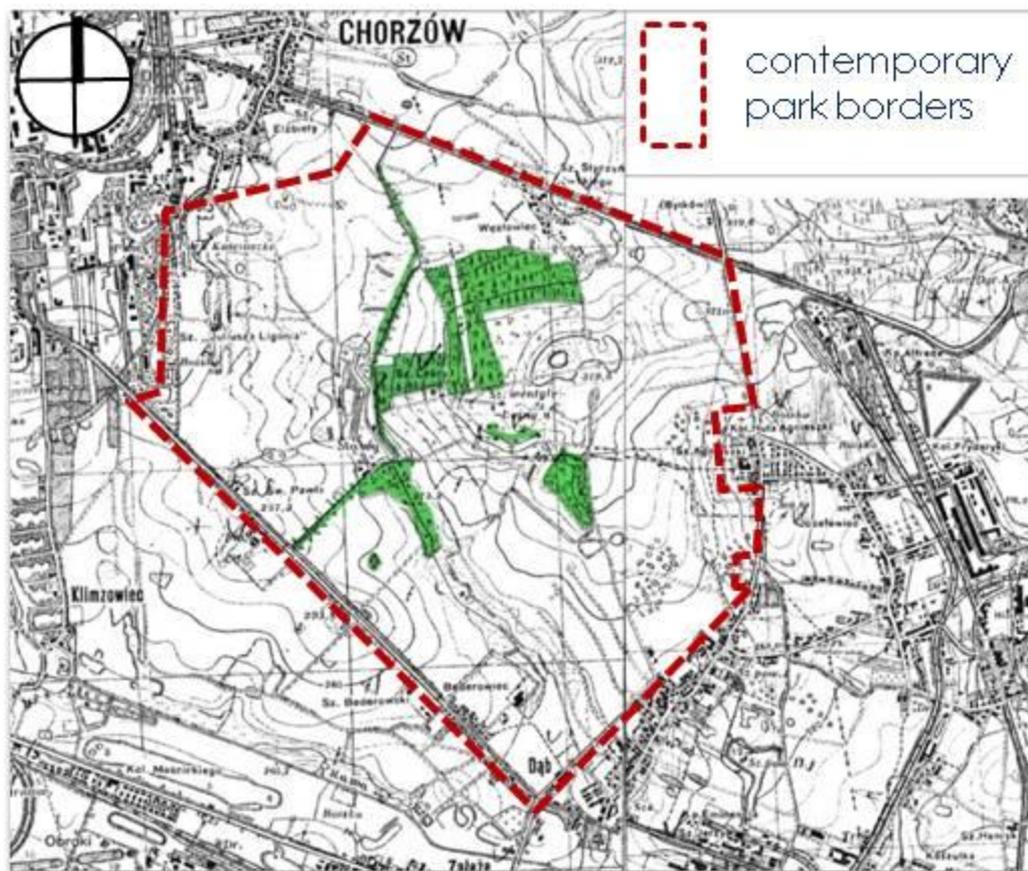
Surroundings of the Park - 3 large industrial cities

Approx. 3 mln visitors per year



## Silesia Park - before park's establishment...

Topographic map (1933) of area between towns: Chorzów, Katowice and Siemianowice Śl.



Mapa topograficzna, skala 1:25000, Pas 47-Słup 28-G, H.  
Wojskowy Instytut Geograficzny, Warszawa 1933.



1930-ties

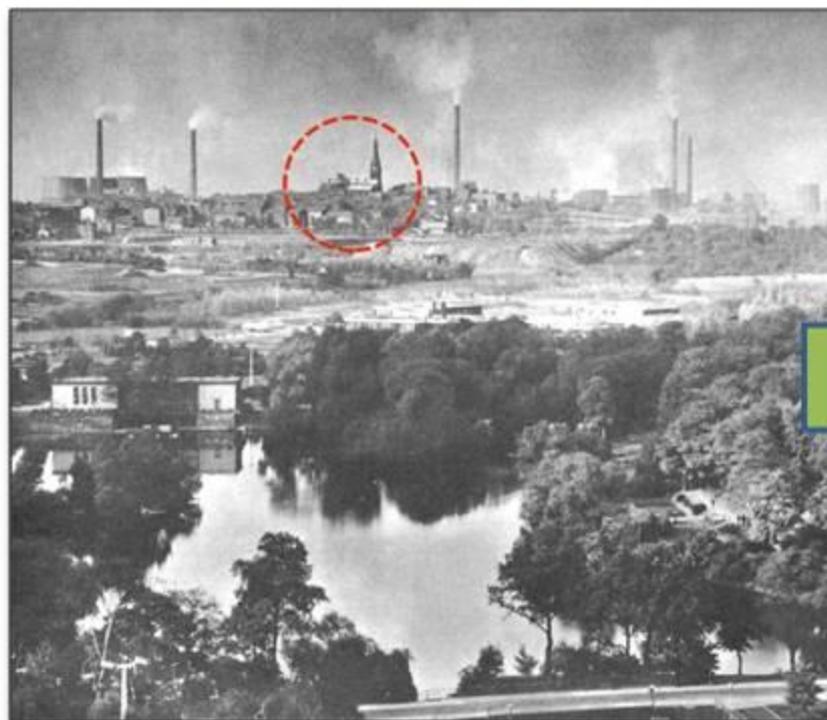


1940-ties

# Silesia Park - the successful re-naturalization of industrial landscape

## landscape transformation

Silesia Park's surroundings in 1950-ties



In the middle – characteristic landmark of the church of St. Mary Magdalene in Chorzów (source: Knobelsdorf, 1972)

After 60 years (2014)

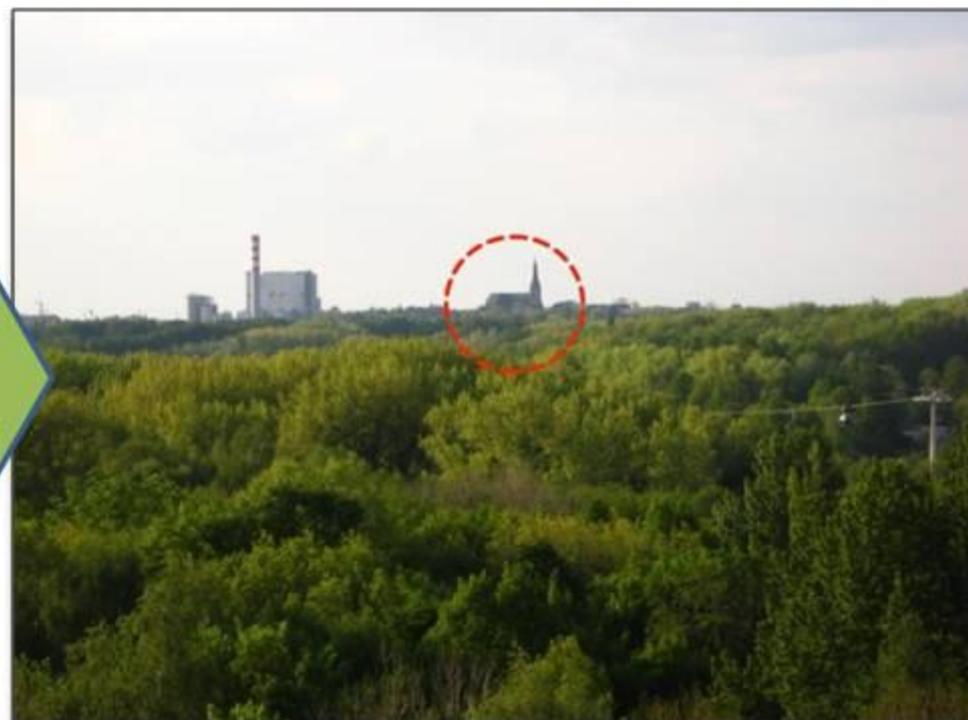


Photo.: P. Wiśniewski / 2014



## Silesia Park - spatial structure of tree stand

**A. intensive area** – forms of park's stand composition (single trees, groups, thickets)



## Silesia Park - spatial structure of tree stand

**B. Extensive area** - dense woodlots - forest formations /  
domination of plant communities of *Quercus-Fagetea* class



## Silesia Park - stand's age structure

**The oldest trees:**  
80/100  
years old



**Mature trees:**  
50/60 years old



**The youngest trees:** 20/30 years old

## Silesia Park - tree stand's transformation

Pioneering and fast growing tree-species have been used as **forecrop** to improve habitat conditions of vegetation:

- originally a grid of approx. 1.0×1.2 m (8333 pcs/ha)
- planned reduction of stand's density (approx. 4000 pcs/ha)



Silesia Park master plan (1962)

Park's existing condition (2017)

## Silesia Park - tree stand's transformation

- since 1980-ties **maintenance** of extensive part (B) of the Park has been **practically neglected** → unattended secondary succession
- erosion of original spatial composition → e.g. **lack of the planned park interiors** which would ensure **irregular tree-stand border supporting biodiversity** (meadow communities) and recreational comfort (insolation)



## Silesia Park - tree stand's transformation

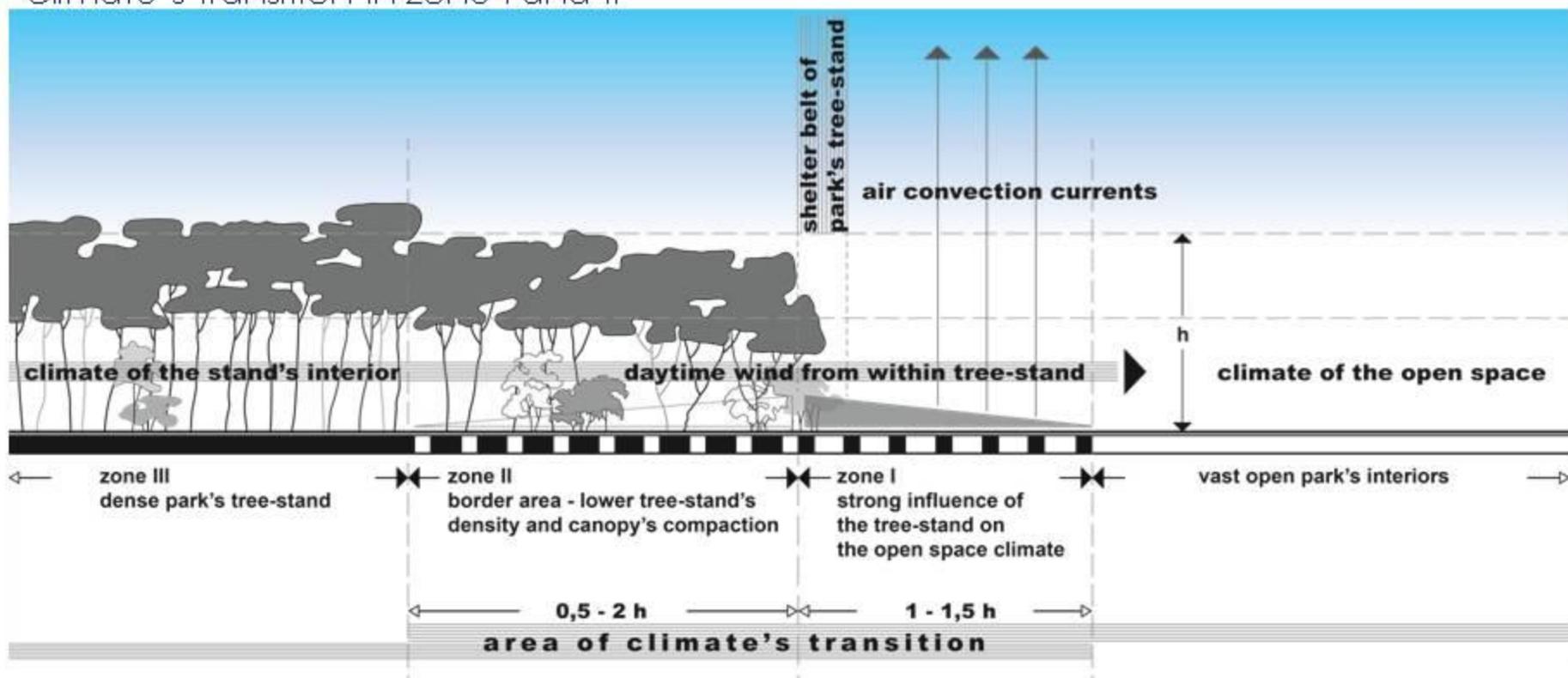
- **Extensive area (B):** plant composition elements – **in majority obliterated**
- **decline** of interiors, blurring view axis



## Park tree-stand's transformation for recreational bioclimate

The **border area of a dense, mature park's tree-stand** (over 40 years old) vs. climate of open space and their interconnections

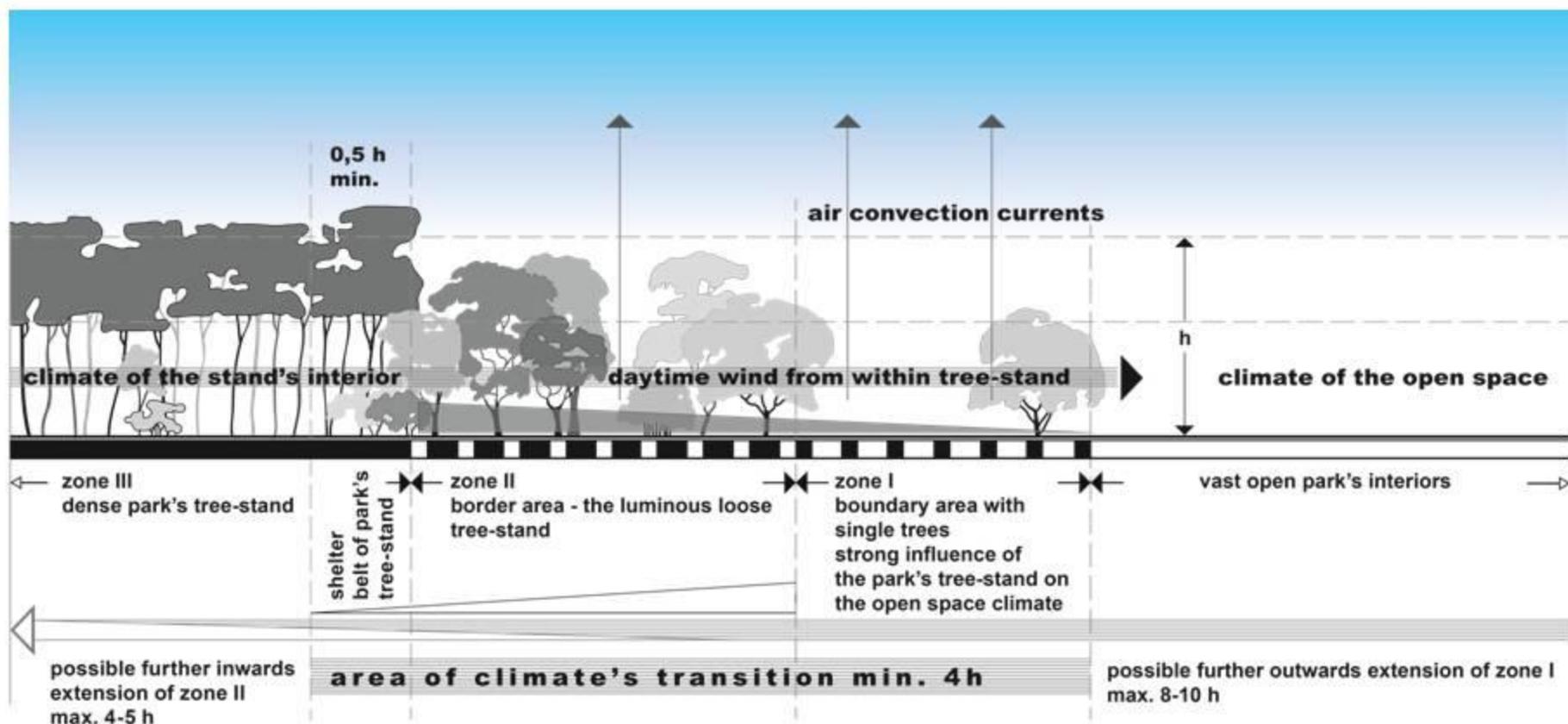
Selected essential conditions for **recreational bioclimate** occurring in area of the climate's transition in zone I and II



System analysed in a vegetation period, S, SW, SE, W and E exposition

## Park tree-stand's transformation for recreational bioclimate

The **transformation** and **stimulation** of climatic conditions and terrain recreation capacity after **adaptation of a border zone** of a dense, mature park's tree-stand over 40 years old (zone I and II) and its relation to an open area.



System analysed in a vegetation period, S, SW, SE, W and E exposition

## Park tree-stand's transformation for recreational bioclimate

Thinning density and a canopy's closure of park's tree-stand characterised by inappropriate faulty spatial structure (excessive density and tree-crown cover):

- easily implemented by restructuring **young tree-stands** (up to 40 years old)
- more challenging with **older tree-stands**, where getting similar effects **requires more time**

Corrections in even aged, dense, monoculture of park **tree-stand**



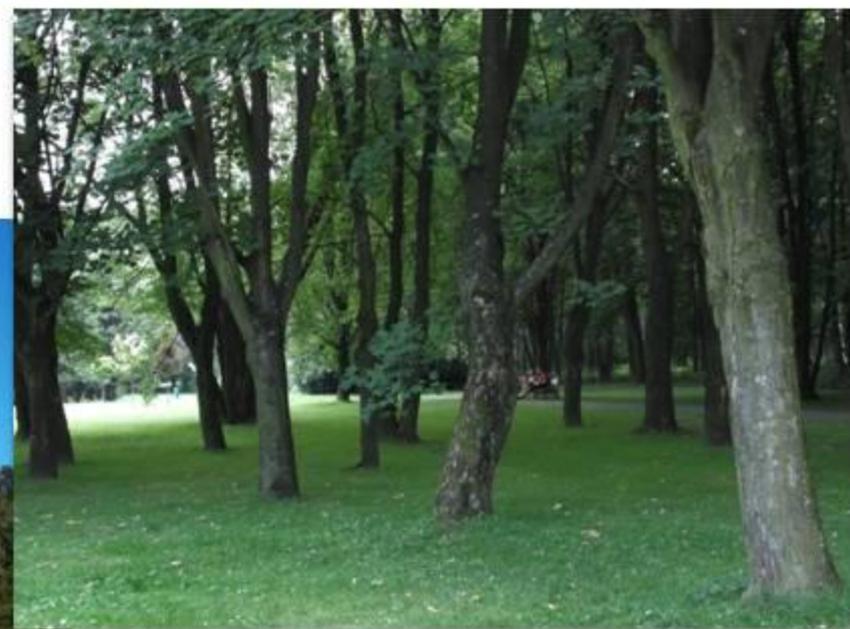
## Park tree-stand's transformation for recreational bioclimate

**The most beneficial** form of tree-stand for high-traffic periodical recreation (in daytime) is a well-lit tree-stand with **a loose tree-crown cover in the max. range within 40-65%**



## Park tree-stand's transformation for recreational bioclimate

In a loose and well-lit tree-stand **air relative humidity** in the recreational layer is not excessively high (e.g. in a tree-stand with dense tree-crown cover it is up to 10% higher than in an open space). It allows **sufficient aeration** and a more favourable daily **vertical movement of air**



## Park tree-stand's transformation for recreational bioclimate

Well-lit tree-stands are **highly resistant to recreational traffic**, have an undergrowth of high compactness and resistance to treading, and **climatic conditions are more favourable for recreation**.



## Park tree-stand's transformation for recreational bioclimate

**Optimum sunlight exposition** (both short and long wavelengths) of the bottom part of the loose tree-stand makes lightning conditions more advantageous for recreation - such as vitamin D<sub>3</sub> skin synthesis



## Park tree-stand's transformation for recreational bioclimate

Trees growing with more light (insolation) have lower **slenderness ratios** ( $s = h / d$ ), live longer, flower and bear fruit more intensively and are **more resistant to degradation**



## Park tree-stand's transformation for recreational bioclimate

Maintenance of large-area park tree-stands should be aimed to keep their desirable form and condition **both for recreation** and for stimulation of **biodiversity** (eg. rich undergrowth)



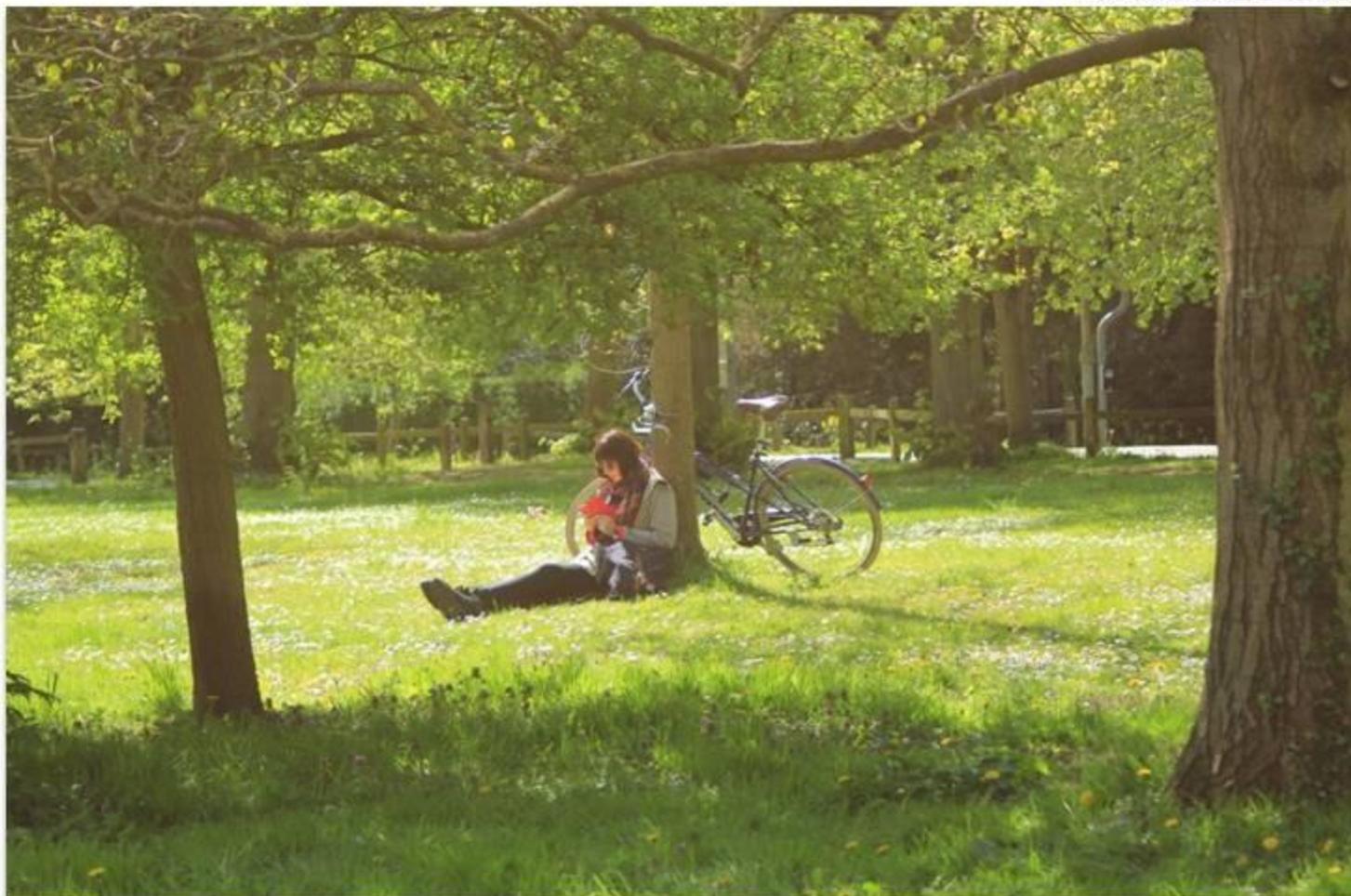
## Conclusions

Whether adaptation of park tree-stand for **recreational purposes** is a threat to its **biodiversity**?

- Park stand's structure has to be **adequately shaped** with its primary function - **recreation** → beneficial **bioclimate for recreation**
- Greatering recreational comfort **does not exclude** simultaneous protection of **biodiversity**, on the contrary - it may even stimulate it !!!
- Maintaining park's tree-stands of optimum quality (in terms of recreational comfort and maintaining actual biodiversity) requires **monitoring** of changes as well as sensible and planned **maintenance activities** (eg. Silesia Park)

# Thank You for your attention!

Photo.: J. Łukaszkiwicz / 2015



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