# Integration of biodiversity conservation intourban developmentThe example of Berlin

Ingo Kowarik Department of Ecology, Technische Universität Berlin State Commissioner for Nature Conservation in Berlin



#### (1) Most of us are urban



#### (2) Urbanization threatens biodiversity

## Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools

Karen C. Seto<sup>a,1</sup>, Burak Güneralp<sup>a,b</sup>, and Lucy R. Hutyra<sup>c</sup> (PNAS 2012)



## (3) Humans are separated from nature, but depend on ecosystem services



"Don't be afraid, darling – we call it tree"





## Why Berlin?



## "Cognitive and social innovations in the field sciences have often been connected to specific places" (Lachmund 2013)

#### Galápagos => Evolutionary biology



#### Slopes of the Andes => Vegetation geography



Chicago => Urban sociology



#### "Berlin has played a similar pivotal role for the emergence of an ecology of the city" (Lachmund 2013)

#### Berlin => Urban ecology





Lachmund J. 2013, MIT Press

## Outline

## Berlin

- History
- Biodiversity research

### Integrating biodiversity into urban devlopment

- Traditional approaches
- Novel approaches
- Berlin's Biodiversity Strategy

## Outline

## Berlin

- History
- Biodiversity research





Berlin, 1652 (Merian)



Borsig (Biermann, 1847)



Urban core, late 19th century



Buckholez Segefel Schönek Kepnil



1662



Green and blue – 41 % Forest 18 %, Water 7 %, Agriculture 5 %, Open space 12 % Developed & traffic areas – 59 %



**Biodiversity research in Berlin** From natural history to urban ecology



#### **Tradition of natural history**



### Demolition of large parts of Berlin during WW II Slow development in West Berlin



## Demolition of large parts of Berlin during WW II Slow development in West Berlin



Botanists in the 1950s

Herbert Sukopp

"The **recolonization of rubble**, created in many cities due to the activity of bombers in the last war, has unintentionally become a **tremendous natural experiment**, which with respect to its size, must be compared to the colonization of new habitats created by volcanic activity." (Pfeiffer 1957)



#### **Conceptual model of a city:** Sukopp 1968, 1973ff. Changes in climate, soils & biota across an urban – rural gradient



## The city as a network of habitats

Studies on biodiversity patterns in a range of land use patterns since 1970s

- Forests, wetlands, rivers, lakes (Auhagen, Böcker, Kunick, Markstein, Seidling ...)
- Demolition areas, wastelands (Scholz, Kohler, Sukopp, Kunick, Kowarik, Fischer, Meffert ...)
- Railway areas, urban woodland (Asmus, Kowarik, Köstler, Westermann, Cierjacks ...)
- Parks (Sukopp, Kunick, Elvers, Trepl, Nath, Peschel, Seitz, von der Lippe ...)
- Graveyards (Graf 1986, Kowarik, von der Lippe, Seitz ...)
- Domestic gardens (Ringenberg, Kronenberg, Maurer ...)
- Grassland (Böcker, Fischer, von der Lippe ...)
- Playgrounds (Kowarik)
- Green roofs (Bornkamm, Darius, Drepper, Köhler ...)
- Industrial sites (Rebele, Werner ...)
- Roadsite habitats (Langer, von der Lippe, Weber ...)
- Airfields (Markstein, Köstler, von der Lippe...)

## The city as a network of habitats

Urban biotope mapping (since 1980s) Berlin Environmental Atlas (since 1990s): biotopes, soil, water, climate ...



Understanding biodiversity drivers

#### Three examples

- Alien vs native plants
- Rare farmland birds
- Ecological novelty

## Response of alien *versus* native plant species to increasing human impact



*Fig. 12.* Number of native and alien species occurring on varying levels of hemeroby (the human impact increases from H1 to H9) [based on 5136 vegetation relevés]

Kowarik 1990

#### Rare farmland birds on vacant lots Which environmental parameter matter?



### Rare farmland birds on vacant lots

Size & vegetation structure more important than human pressure



Meffert et al. 2012

#### Hobbs et al. (2013): Three distinct types of ecosystems

Historical systems Hybrid systems Novel systems














#### Adopting the novel ecosystem concept to urban settings



Kowarik & von der Lippe, close to submission

## **Conservation functions ?**



Kowarik & von der Lippe, close to submission

## **Conservation functions ?**



# From understanding to action !

Integrating biodiversity into the green infrastructure Conservation areas & public parks

#### - Conservation areas

 Protected hunting grounds since 16th century



#### - Conservation areas

 Protected hunting grounds since 16th century



 Some wetlands and forest remnants protected since 1920s



#### - Conservation areas

 Protected hunting grounds since 16th century

- Some wetlands and forest remnants protected since 1920s
- Today: Different types of conservation areas, mostly at the urban fringe



## - Parks

Historical parks since 17th century



## - Parks

 Historical parks since 17th century

## "Volksparks" & first "green belt", mid-19th century (Peter Joseph Lenné)



Novel approaches Novel park typologies





# Urbanisation **destroys** nature





# Urbanisation transforms nature

(=> "Four natures" within city porders)











# Landscape program integrates conservation issues and social issues

- Recreation activities
- Landscape scenery
- Environmental protection
- Species and habitats

- Multiple functions of urban green spaces
- Need for green space close to people
  => potential of urban wastelands



## Novel approaches

### Novel park typologies

New parks & green belts since 1990s 



#### Berliner Parkringe mit Naherholungsgebieten

#### Innerer Parkring

- Mauerpark
- Stadtpark Eldenaer Straße
- Parkanlage Alt-Stralau
- Volkspark Tempelhofer Feld
- Natur-Park Südgelände
- Stadtoark Gleisdreieck
- Stadteilpark Nordbahnhof
- Stadtteilpark Moabit
- Natur-Park Schönholz

#### Außerer Parkring

- Volkspark Staaken 10
- 11 Park Lichterfelde
- Landschaftspark Buckower Felder 12 13
  - Landschaftspark Rudow-Altglienicke
- 14 Volkspark Johannisthal
- 15 Erholungsgebiet Kaulsdorfer Seen
- 16 Erholungsgebiet Wuhletal
- 17 Naherholungsgebiet Berliner Barnim

#### Naherholungsgebiete

- Müggelsee und Müggelberge A
- B Havel, Grunewald und Wannsee
- С Tegler See und Spandauer Forst D
  - Berliner Barnim
- New parks







## "Südgelände"

Railway area since 1890s

- Succession since 1952 Design of a new park, 1990s
- Protected as compensation area
- Park opening 2000



### **Basic principles**

- Respect for "genus loci"
- Let people come in
- Allow woodland dynamics
- Conserve grassland diversity
- Conserve cultural remnants
- Zoning plan









"Südgelände"

### **Basic principles**

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### => Interventions

- Public access
- Information
- Hazard control
- Artwork
- Succession control





# Exotic status doesn't matter within conservation area



### **Basic principles**

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#### Zoning plan

The former amitakyand was brane

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#### It all started with a railroad installation

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Enjoy nature's rich array of colors

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procesor syrand the undergrowth in red.

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Sector interest

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#### A forest emerges

Sectorially ......

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Maintaining diversity

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Berlin Berlin

Schöneberger Südgelände ᇄ Nature Park



#### From railroad tracks to walks aya The Bodgelando Nature hark is dear-acterized by an intriguing combine-tion of nature, railway artifacts, and art. Victure are led along variouspe

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the nature concernation area. It link

- \* -

#### A velicienness in the heart of the city

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Little by little, nature task

#### The Nature Parkment offers on inspecche variety of egodies dance here, since many plants and in-casts from the currounding country-

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## Tempelhof airfield

380 ha

## **Tempelhof airfield**



Airport until 2008 Public access to airfield 2010 Ideas for urban development & new park Biodiversity analyses

Flughafen Berlin-Tempelhof











Dry grassland types, farmland species Skylarch as target species Linking biodiversity with landscape scenery

### About 25% of Berlin's skylark populations on Tempelhof airfield



Foto: Andreas Klein

## Tempelhof airfield

## Ideas of the government ...

150 ha: New housing areas, industrial areas, central library...
 230 ha: A new park, international garden exhibition...

## Tempelhof airfield

## Ideas of the government ...

- 150 ha: New housing areas, industrial areas, central library...
  230 ha: A new park, international garden exhibition...
  - => Landscape architecture competition, with biodiversity conservation as one important target


Tempelhof airfield

# **Other ideas ...** *Keep it 100% open => Referendum*



# 25 May 2014 Success of the referendum

## voter turnout 46%; approval 64%



## **Tempelhof airfield**





Co-existence of urban people & biodiversity continues...

Biodiversity friendly grassland management

Restricted access to some parts during breeding season



## **Tempelhof airfield**



Co-existence of urban people & biodiversity continues...

**Biodiversity monitoring** (birds, plants, grasshoppers)

=> No significant decrease
 since opening 2010

# Integrating biodiversity into urban devlopment

- Traditional approaches
- Novel approaches
- Berlin's Biodiversity Strategy
  - Framing
  - Conception & implementation
  - Topics & targets

# Basic strategy for Green Berlin (2012) Green – the beautiful city – be happy



Strategie Stadtlandschaft Berlin natürlich urban produktiv

# Basic strategy for Green Berlin (2012) Green – the beautiful city – be happy



# Basic strategy for Green Berlin (2012) Green – the beautiful city – makes happy

be ---- Berlin



Strategie Stadtlandschaft Berlin natürlich urban produktiv Urban nature



# Basic strategy for Green Berlin (2012) Green – the beautiful city – makes happy



### Topics for implementation

# Specification needed => Berlin's Biodiversity Strategy (2012)



**Berlins Biologische Vielfalt** 

Berliner Strategle zur Biologischen Vielfalt

Begründung, Themenfel und strategische Ziele

## Main targets

- Reconcile urban development with biodiversity conservation
- Ecosystem services for urban people
- Integrate biodiversity issues in each land use type
- Involve stakeholders

## Berlin's Biodiversity Strategy: Conception & implementation



## Berlin's Biodiversity Strategy: Conception & implementation



## **Berlin's Biodiversity Strategy: Conception (2009-2011)**



## **Berlin's Biodiversity Strategy: Implementation (since 2012)**



## **Berlin's Biodiversity Strategy: Implementation** (since 2012)



## **Berlin's Biodiversity Strategy: Implementation** (since 2012)



#### **Topic 1: Species and habitats** Arten und Lebensräume **Genetische Vielfalt** 1. Species diversity and Artenvielfalt und Verantwortung für besondere Arten (1) Regionale Vielfalt (14) responsibility for target species Gebietsfremde Arten (2) Erhaltung durch Nutzung (15) 2. Nonnative species Gebietseigene Pflanzen (16) FFH-Lebensräume (3) Besonders geschützte Biotope (4) Gentechnisch veränderte Pflanzen (17) 3. Habitat types of the EU Habitat Biotopverbund (5) Directive Durchgängigkeit von Gewässern (6) 4. Legally protected habitats Naturnahe Gewässer (7) 5. Habitat network Röhricht (8) 6. Connectivity of water bodies Grundwasser (9) Moore (10) 7. Semi-natural waters Landwirtschaft (11) 8. Reed beds Waldtypen (12) 9. Ground water Waldzustand und -bewirtschaftung (13) 10. Bogs 11. Agriculture Berliner Strategie zur 12. Forest types biologischen 13. Status and management of Vielfalt forests **Urbane Vielfalt** Gesellschaft Öffentliches Bau- und Beschaffungswesen (26) Typisch urbane Arten (18) Urbane Wildnisentwicklung (19) Rechtliche Regelungen und Planungsgrundlagen (27) Umweltbildung (28-30) Urbane Gärten (20) Grünflächen (21) Forschung (31) Naturerleben (32, 33) Private Freiflächen (22) Biologische Vielfalt auf Firmengeländen (23) Engagement der Wirtschaft (34, 35) Globale Verantwortung (36, 37) Straßenbäume und Straßenbegleitgrün (24) Urbane Offenlandschaften (25) Gesellschaftliches Engagement (38)





"Florenschutz" Stiftung Naturschutz

### **Topic 1: Species and habitats**

### 1. Species diversity and responsibility for target species

- 2. Nonnative species
- 3. Habitat types of the EU Habitat Directive
- 4. Legally protected habitats
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- 6. Connectivity of water bodies
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- Definition of target species: 230 rare plant species
- Monitoring of populations by specialists



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- Monitoring of populations by specialists
- Management, re-introduction



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 General acceptance of alien species as characteristic component of many urban spaces



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- General acceptance of alien species as characteristic component of many urban spaces
- Control only in case of adverse impacts on species of conservation concern



#### **Topic 1: Species and habitats** Topic 2: Arten und Lebensräume **Genetische Vielfalt Genetic diversity** 1. Species diversity and Artenvielfalt und Verantwortung für besondere Arten (1) Regionale Vielfalt (14) responsibility for target species 14. Regional diversity Gebietsfremde Arten (2) Erhaltung durch Nutzung (15) 2. Nonnative species FFH-Lebensräume (3) Gebietseigene Pflanzen (16) 15. Conservation & use Besonders geschützte Biotope (4) Gentechnisch veränderte Pflanzen (17) 3. Habitat types of the EU Habitat **16.Regional** Biotopverbund (5) Directive Durchgängigkeit von Gewässern (6) 4. Legally protected habitats provenances Naturnahe Gewässer (7) 5. Habitat network Röhricht (8) 17. Genetically modified 6. Connectivity of water bodies Grundwasser (9) plants Moore (10) 7. Semi-natural waters Landwirtschaft (11) 8. Reed beds Waldtypen (12) 9. Ground water Waldzustand und -bewirtschaftung (13) 10. Bogs Berliner 11. Agriculture Strategie zur 12. Forest types biologischen 13. Status and management of Vielfalt forests **Urbane Vielfalt** Gesellschaft Öffentliches Bau- und Beschaffungswesen (26) Typisch urbane Arten (18) Urbane Wildnisentwicklung (19) Rechtliche Regelungen und Planungsgrundlagen (27) Umweltbildung (28-30) Urbane Gärten (20) Grünflächen (21) Forschung (31) Naturerleben (32, 33) Private Freiflächen (22) Biologische Vielfalt auf Firmengeländen (23) Engagement der Wirtschaft (34, 35) Globale Verantwortung (36, 37) Straßenbäume und Straßenbegleitgrün (24) Urbane Offenlandschaften (25) Gesellschaftliches Engagement (38)



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- Ideas how and where to use native species
- Encourage regional provenances (=regional seed pool) when planting or sowing native species

Topic 2: Genetic diversity 14. Regional diversity 15. Conservation & use 16.Regional

### provenances

17. Genetically modified plants



**Pflanzen für Berlin** Verwendung gebietseigener Herkünfte



# Grassland species from regional seed sources can be successfully added to wasteland vegetation (Fischer, von der Lippe, Kowarik et al. 2013, Cons. Biol.)





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### **Topic 1: Species and habitats**

- 1. Species diversity and responsibility for target species
- 2. Nonnative species
- 3. Habitat types of the EU Habitat Directive
- 4. Legally protected habitats
- 5. Habitat network
- 6. Connectivity of water bodies
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- 11. Agriculture
- 12. Forest types
- 13. Status and management of forests

### **Topic 3: Urban diversity**

- 18. Typical urban species
- 19. Urban wildness
- 20. Urban gardening
- 21. Parks
- 22. Private gardens
- 23. Biodiversity on industrial real estates
- 24. Vegetation along streets

### **25.Former airfields**

 Conserving large grassland areas at **both** urban airports (Tempelhof, Tegel)



### Topic 2: Genetic diversity

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- Biodiversity-friendly management of parks
  - Maintaining structures of mature trees
  - Adjusting mowing regimes

### Topic 2:

### **Genetic diversity**

- 14. Regional diversity
- 15. Conservation & use
- 16. Regional provenances
- 17. Genetically modified plants



- 26. Public purchasing management
- 27. Legal regulations and planning
- 28-30 Environmental education
- 31. Research
- 32-33 Nature experience
- 34-35 Corporate citizenship
- 36-37 Global responsibility
- 38. Community activities

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New type of green space:

## "Nature experience areas for children"

close (< 300 m) to housing areas



### Topic 2:

### **Genetic diversity**

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- 17. Genetically modified plants

### **Topic 4: Society**

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- 27. Legal regulations and planning
- 28-30 Environmental education
- 31. Research

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# Berlin's Biodiversity Strategy (2012)



**Berlins Biologische Vielfalt** 

Berliner Strategie zur Biologischen Vielfalt

Begründung, Themenfelder und strategische Ziele  Targets to integrate biodiversity issues in each land use

- Stakeholder involvement
- Broad acceptance within society ¥

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- Stakeholder involvement
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- No thresholds, no deadlines
- Resources for implementation limited

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Begründung, Themenfelder und strategische Ziele

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# The journey is the reward ...
## Integration of biodiversity conservation intourban developmentThe example of Berlin

- 1. Co-operation science urban planning society
- 2. Traditional antagonisms covercome (city vs. nature; native vs. alien)

Conclusions

1.3.3.111

3. Multiple opportunities to enhance urban biodiversity

## Thanks for your attention

