Cicli di produzione della biomassa

La filiera della forestazione urbana

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con

Nicola Colaninno, **Erpinio Labrozzi**, Dastu, Laboratorio di Simulazione Urbana Fausto Curti

Livia Shamir, Dastu, Future Cities Lab

01
ForestaMI


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Let's plant together 3 million trees by 2030
in the Metropolitan City of Milan

PLANNING FOR 3 MILLION TREES: ESTIMATION OF POTENTIAL AREES AND SCENARIOS

Laboratorio di Simulazione Urbana Fausto Curti
Nicola Colaninno, Eugenio Morello, Ahmed ElDesoky

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3 Million trees, sure, but where?

Objectives

- **Main objective**: To provide an **estimate of the potential of forestry** in the metropolitan city of Milan in order to validate the main ForestaMI objective of planting 3 million equivalent trees and thus support the feasibility of the entire urban forestry programme.

- **Secondary objective**: **Identify the different project focuses** and their respective quantitative potentials, in order to provide a support tool for the decision and planning of the appropriate policy and governance tools in order to pursue the achievement of the goal set by the project.

3 Million trees, sure, but where?

- Step 1: **Estimating the current tree canopy coverage**

Estimation procedure based on image statistics of PlanetScope satellite data (NDVI and Red) and refinement, obtained crossing data DUSAF, DBT photo-interpretation

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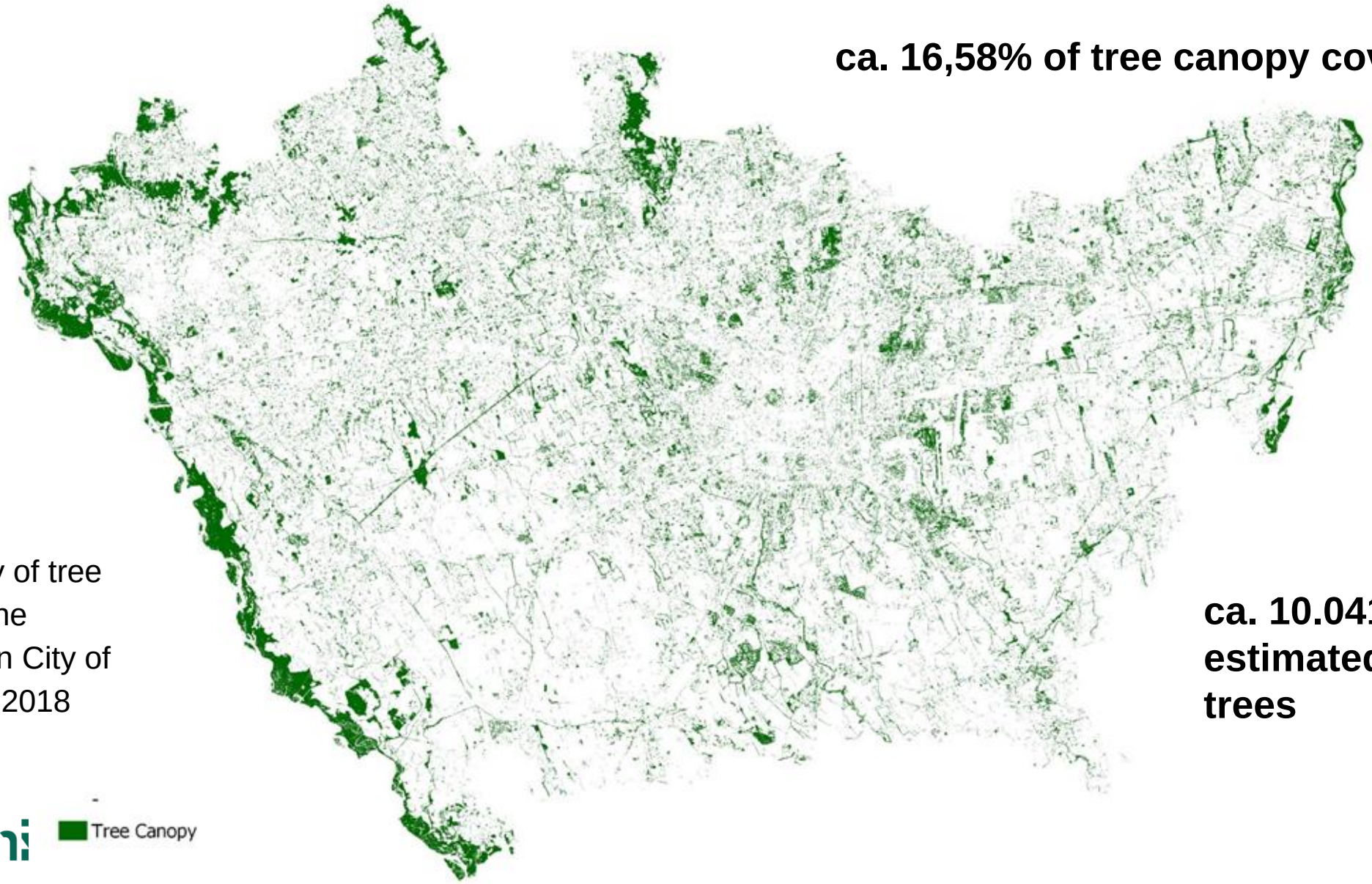
Tree canopy estimation for the metropolitan City

ca. 16,58% of tree canopy coverage



Map of the consistency of tree canopy in the Metropolitan City of Milan as of 2018

ca. 10.041.000 estimated existing trees

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Number of trees’ estimation

- Step 2, from tree canopy to the **quantification of trees’ number**

Calculated with the planting layouts provided for different types of forestation / trees and the criteria already used by the metropolitan City of Milan.

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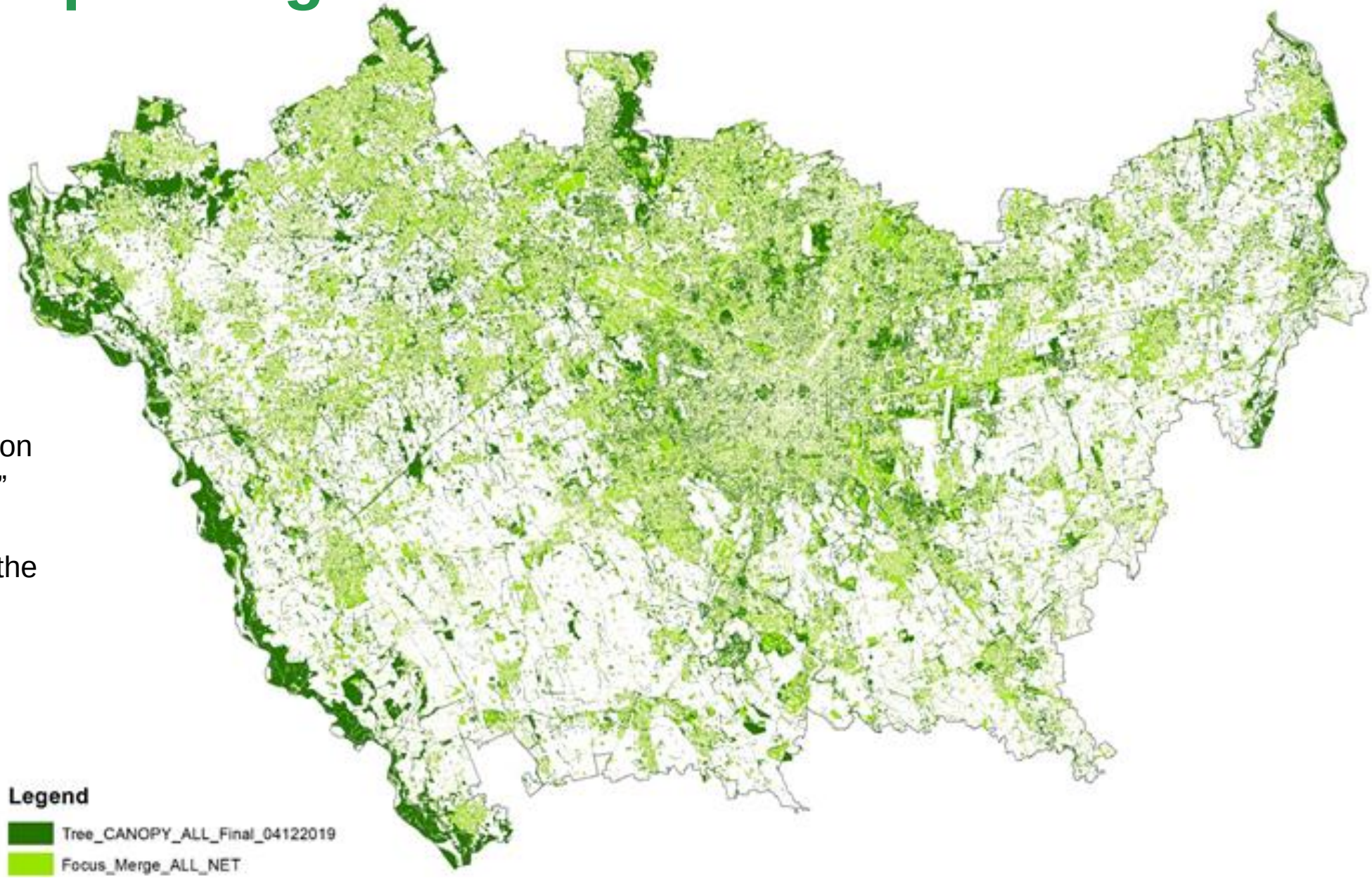
Potential for planting new trees

- Step 3, the construction of a “top down model” for **estimating the potential areas** and the different layouts for planting new tees.



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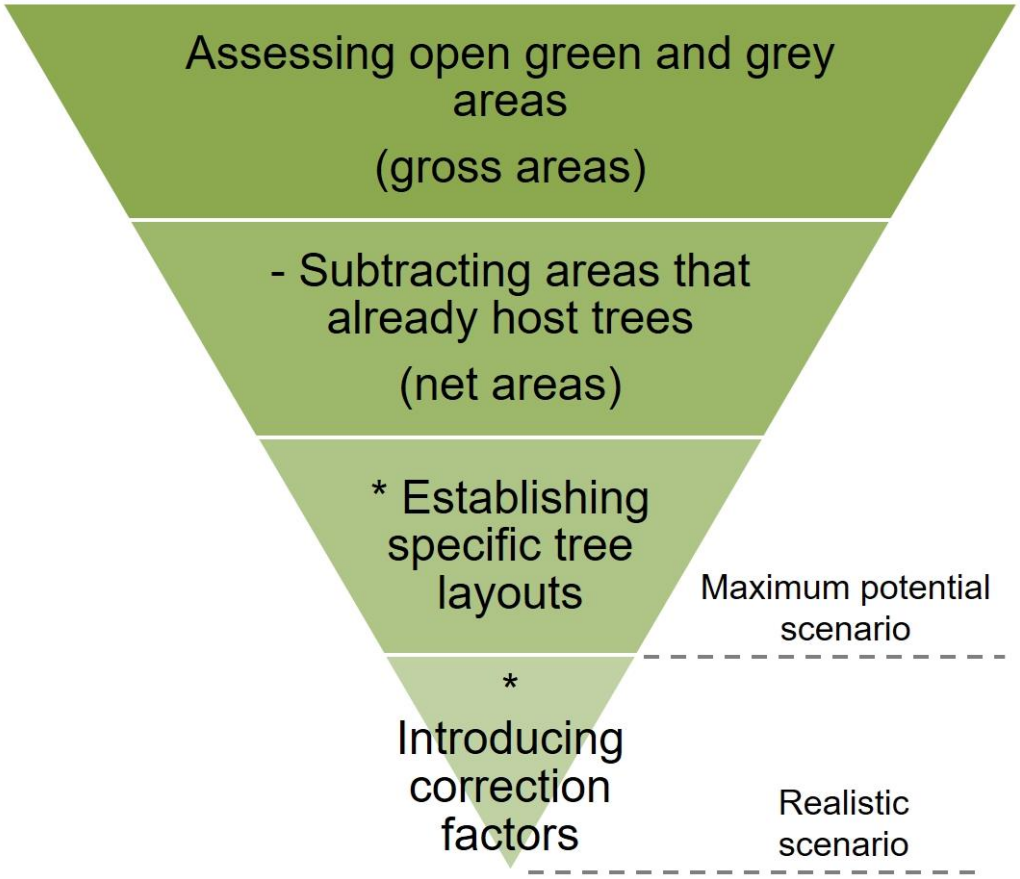
A top-down scenario

The study promotes **“top-down” quantitative estimation work** to be combined with “bottom-up” listening and mapping of the territory of the Metropolitan City of Milan.

The work is based on open or free databases in order to propose a method that can also be replicated in other territorial contexts.



ca. 6.144.000 new trees

ca. 3.119.000 trees

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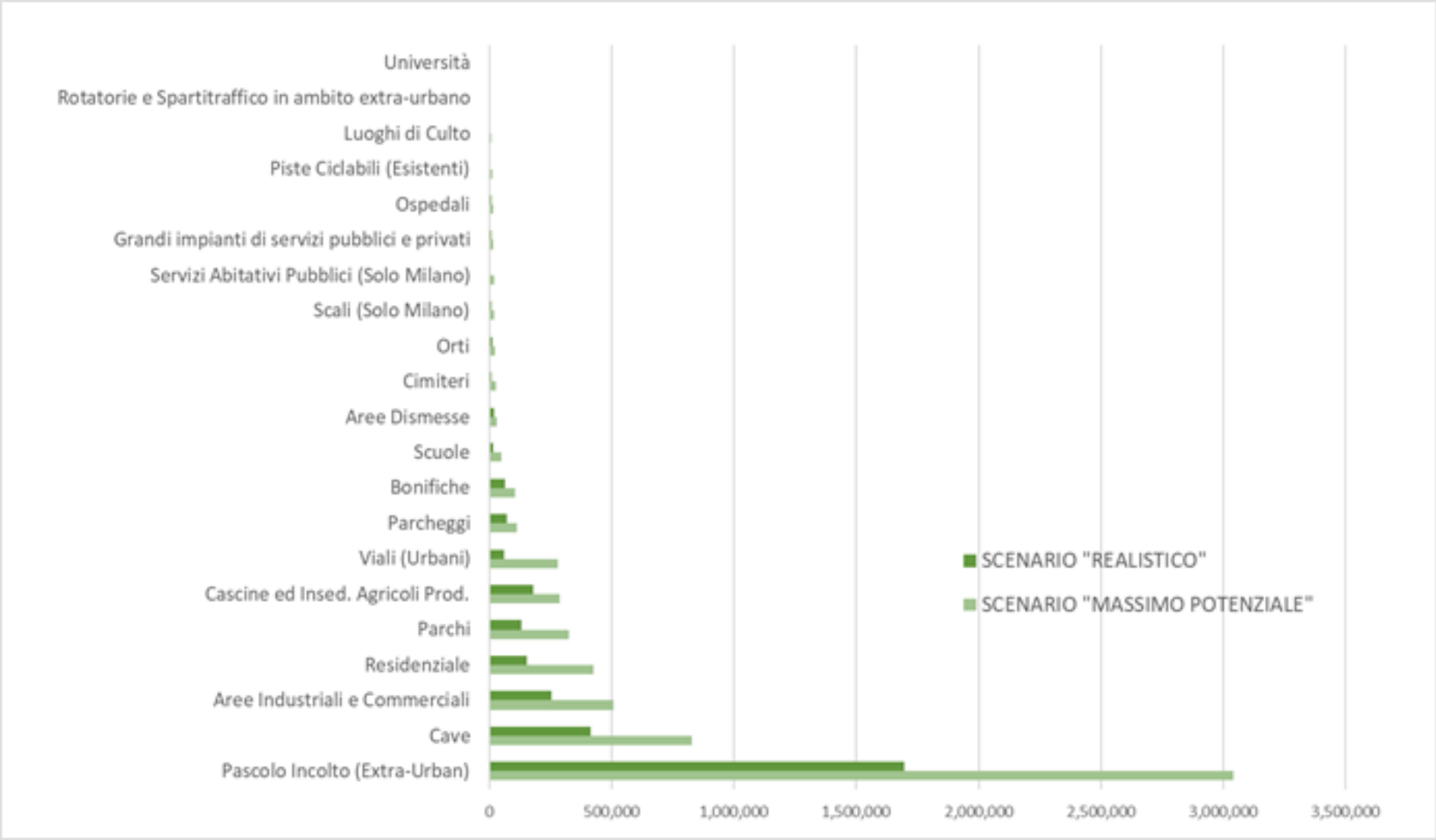
2 scenarios, 21 design focuses



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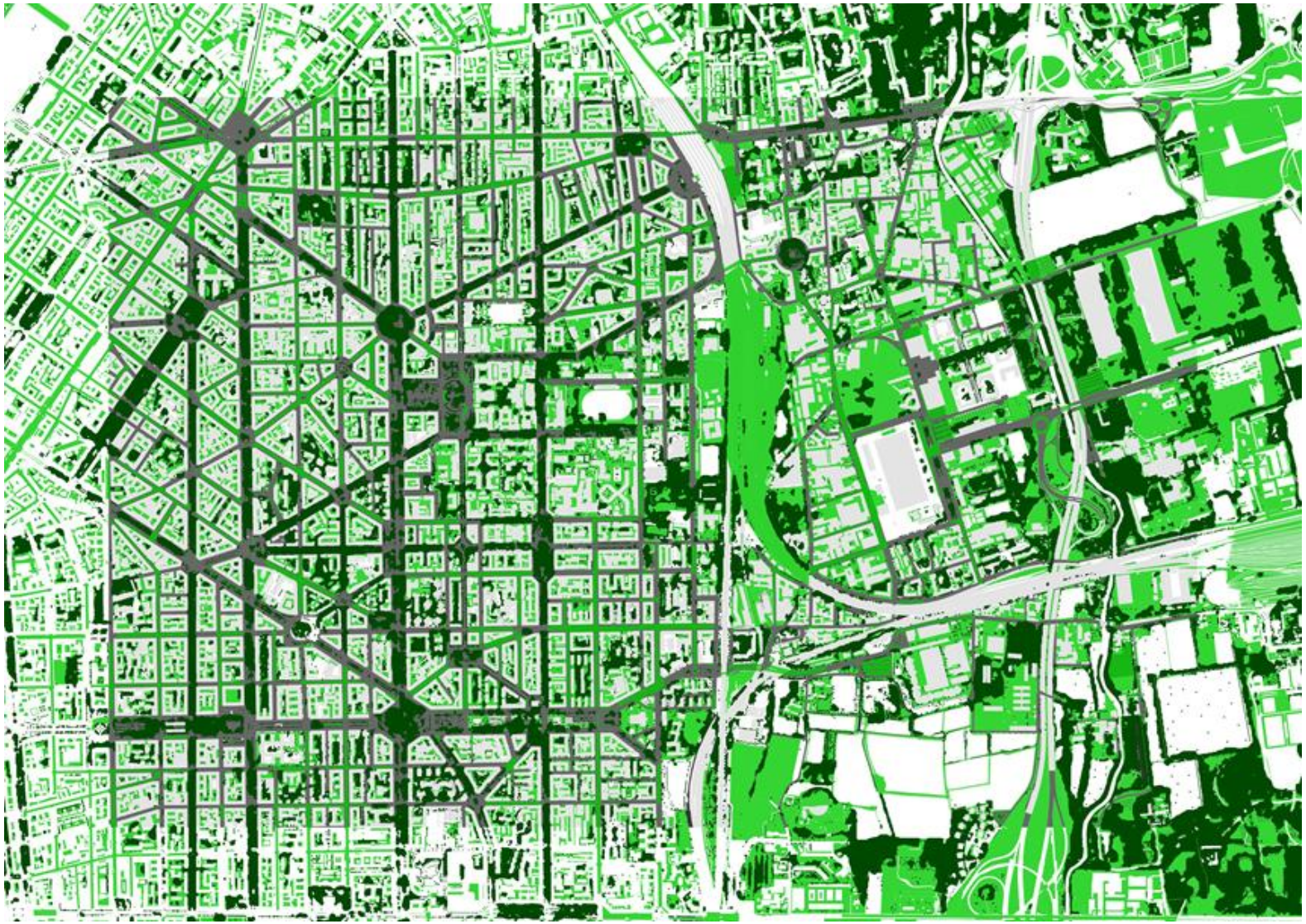
How to use the Map of Tree Planting Potential

The maps can be used to make a first screening of the potential areas at the local level (community, neighbourhood, municipality)



bright green:
all the open spaces (public and private) potentially available for planting

Dark green:
The existing tree canopy

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Prospettive di circolarità

1. Aumento della produzione locale di piante.
La messa a dimora di 3M di alberi richiede una progettazione e produzione importante, ben oltre alla capacità corrente dei vivai regionali.

- Produzione attuale: circa 300.000 piantine forestali/anno (il cui 70% viene venduto a privati) → necessità di incremento produzione: +150.00 - 200.000 piante forestali/anno.
- Ipotesi triangolazione vivaio ERSAF Lombardia con vivai di Veneto Agricoltura e Piemonte Vivai (anch'essi producono circa 300.000 piante forestali/anno).
- In fase di valutazione anche il coinvolgimento di vivai commerciali, potenziale interesse nello sviluppare una filiera verde intorno alla forestazione urbana e peri-urbana.

2. Carbon credits. Oltre al contributo della forestazione come carbon sink, si sta esplorando lo stoccaggio della CO2 mediante arredo urbano.

Prospettive di circolarità

3. Scarti da potatura dei giardini urbani per produrre biochar (ed ev. energia termica)

Ref: Stockholm, Sweden “The world’s first large-scale ‘biochar’ urban carbon sink”
8,000 tonnes of suitable garden waste collected, per year, of which 1,200 tonnes of garden waste transformed into:
• biochar (300t),
• > 1,000 CO2 equivalent carbon sink
• > 1,000 MWh generated in renewable heat production
.
https://www.c40.org/researches/municipality-led-circular-economy

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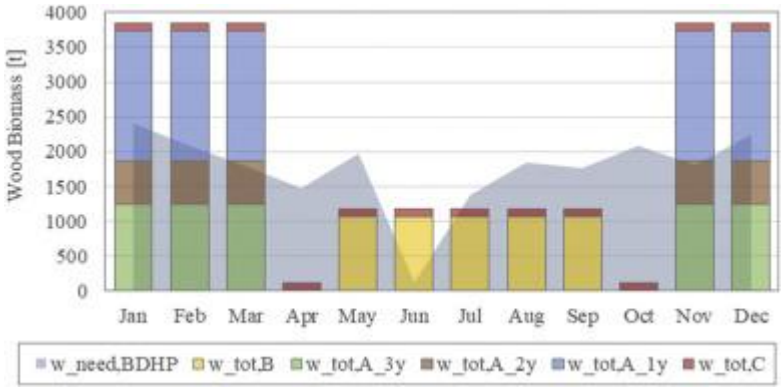
02

Biomassa da potatura

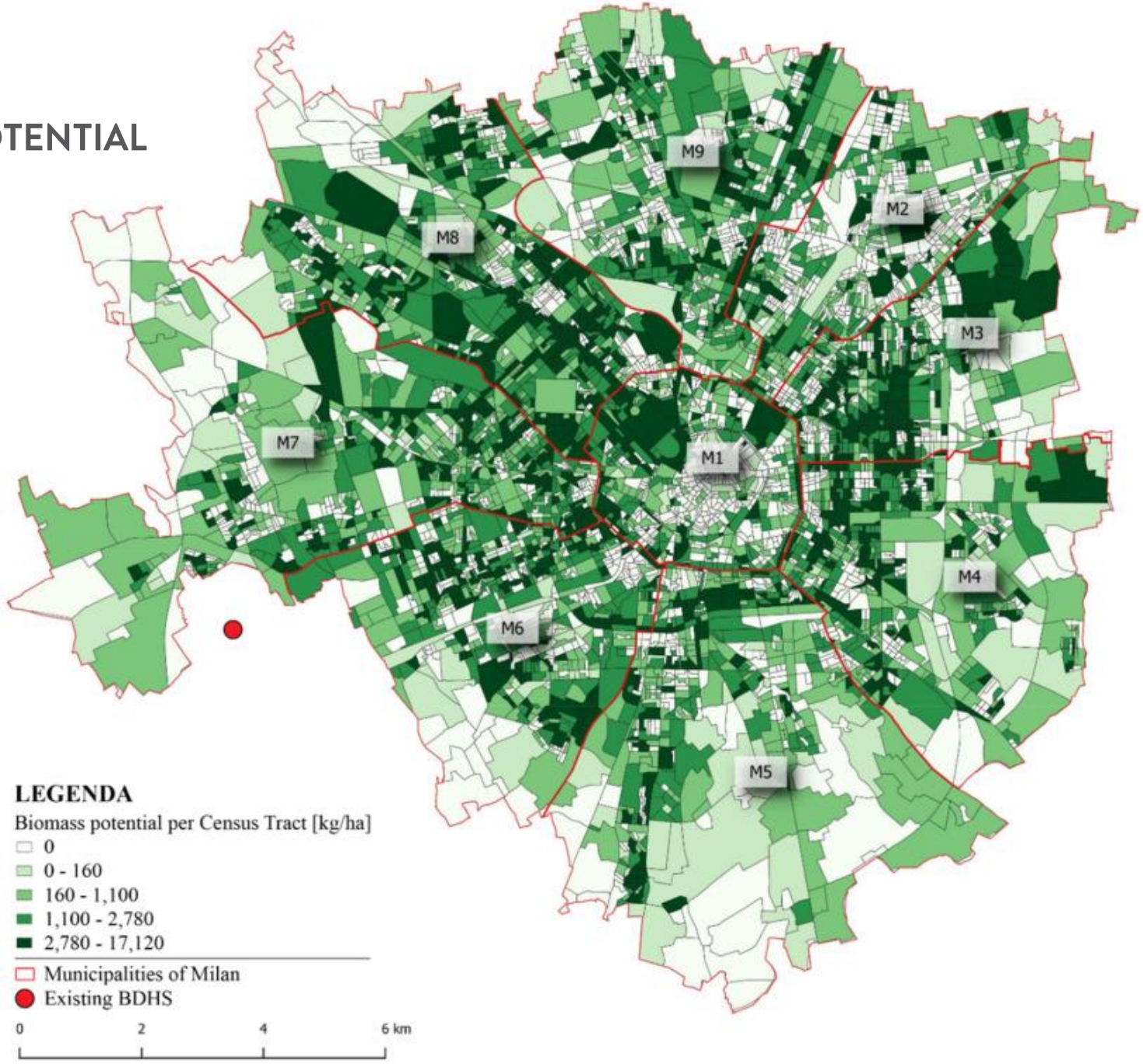
REVEALING THE URBAN BIOMASS POTENTIAL

Urban Greenery Management and **energy planning**: A GIS-based potential evaluation of pruning by-products for energy application for the city of Milan.



Monthly quantities of pruning by-products available for the different pruning cycles assumed in comparison to the biomass consumption of the BDHP

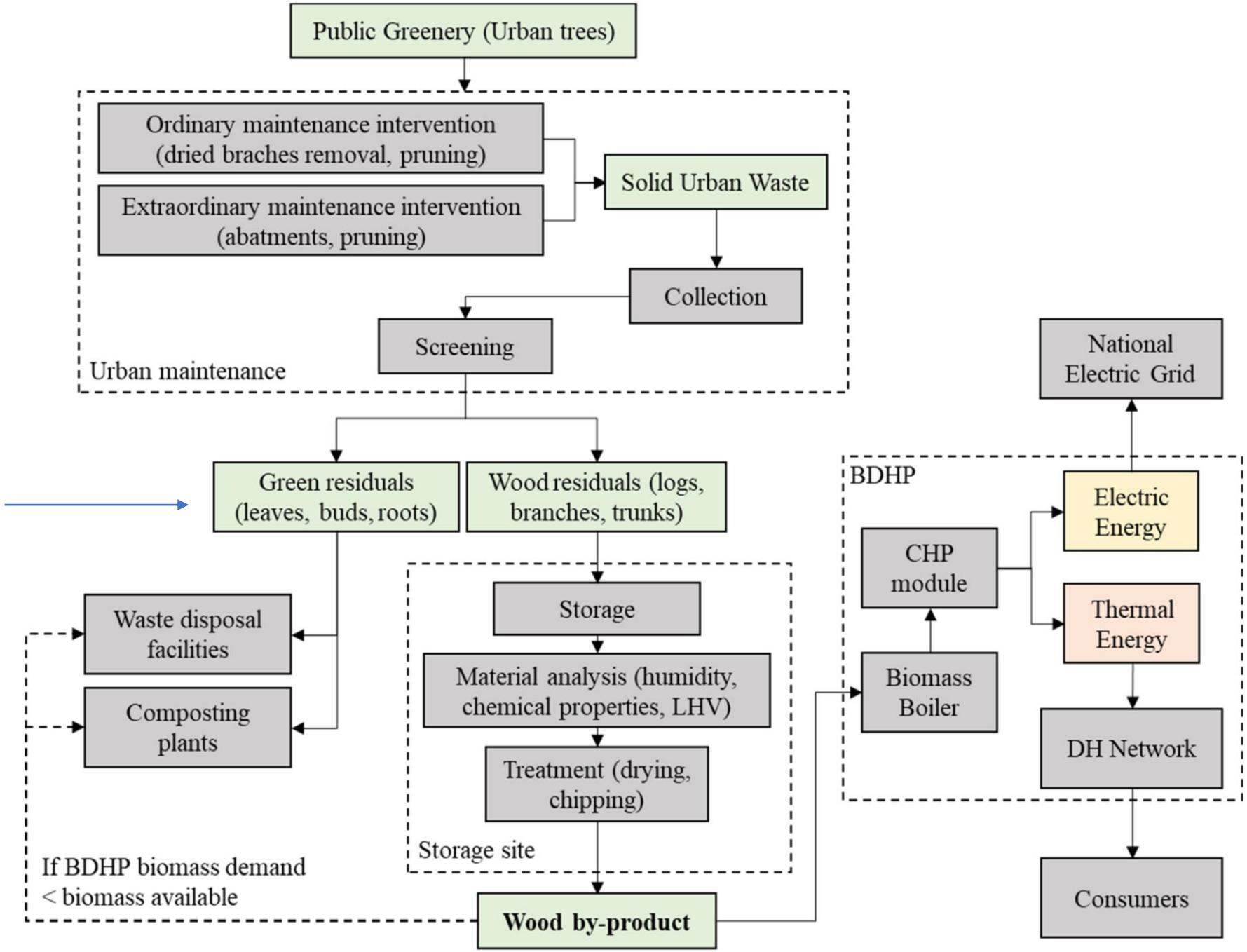
G. Ferla, P. Caputo, N. Colaninno, E. Morello, 2020, Urban greenery management and energy planning: A GIS-based potential evaluation of pruning by-products for energy application for the city of Milan, Renewable Energy, 160, https://doi.org/10.1016/j.renene.2020.06.105



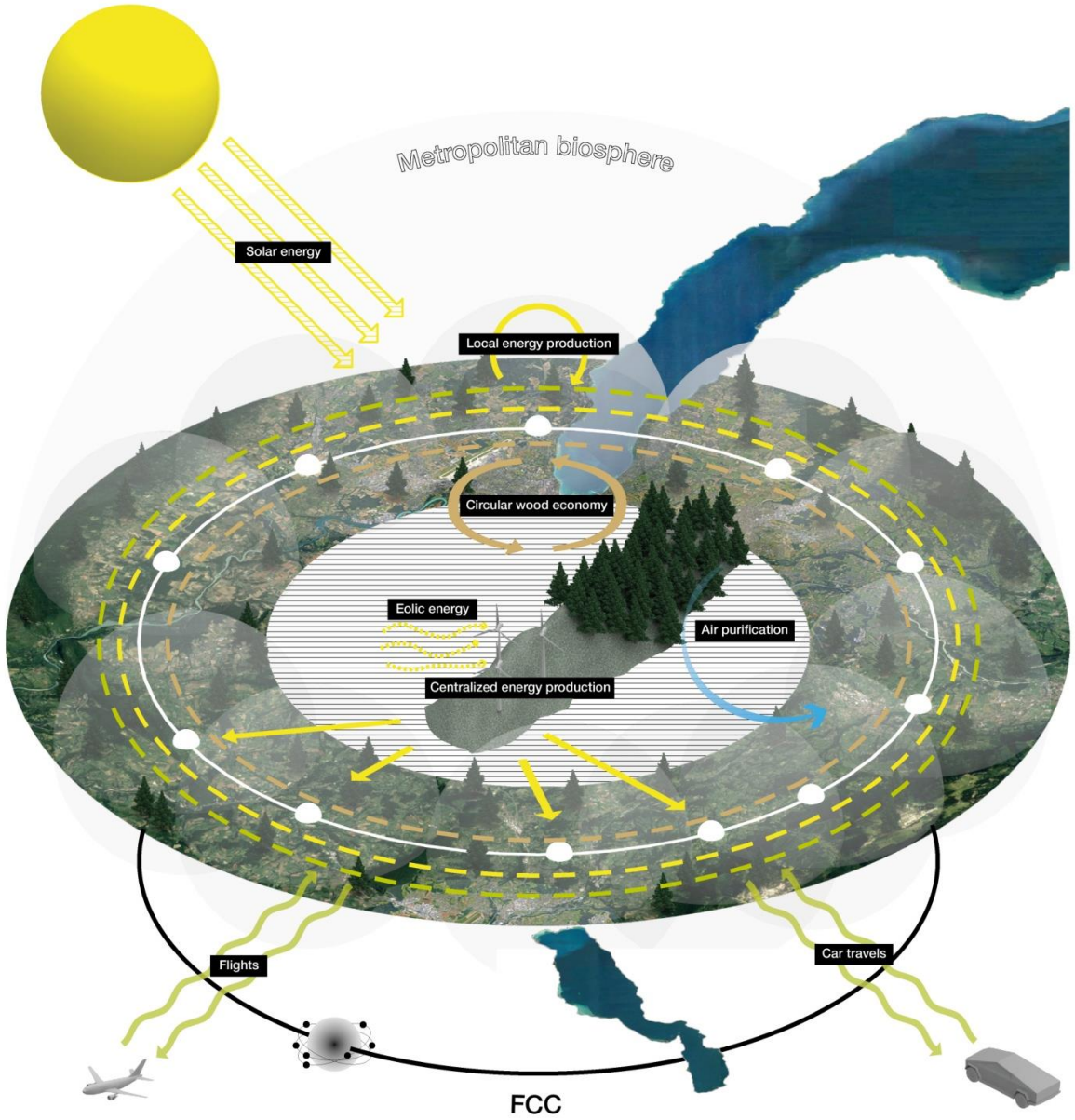
Dendrometric equations allow the estimation of tree volume and aboveground **phytomass** over a large number of trees.

The aim is to define, with the best approximation possible, the **fraction of wood removed by pruning;** the trees as a function of their weight

Results:
Primary Energy ranges between 26 and 76 GWh, depending on pruning frequency and on the chemical-physical properties of the obtained wood biomass



03
Circular wood for Consultation Grand Genève



THE TRANSITION TOWARDS A NATURE-BASED METROPOLIS

Eugenio Morello
with Erpinio Labrozzi

Energy
People
Resouces
Air


Photo By Whgler/ CC BY-SA 3.0 / modified

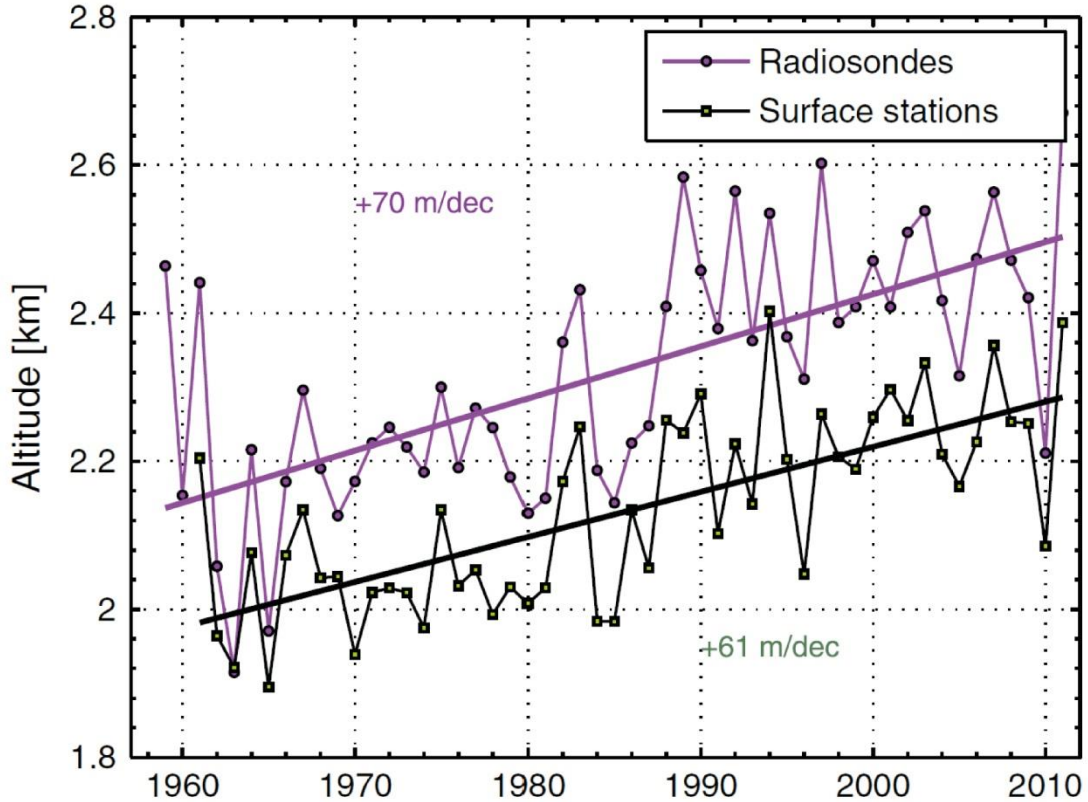


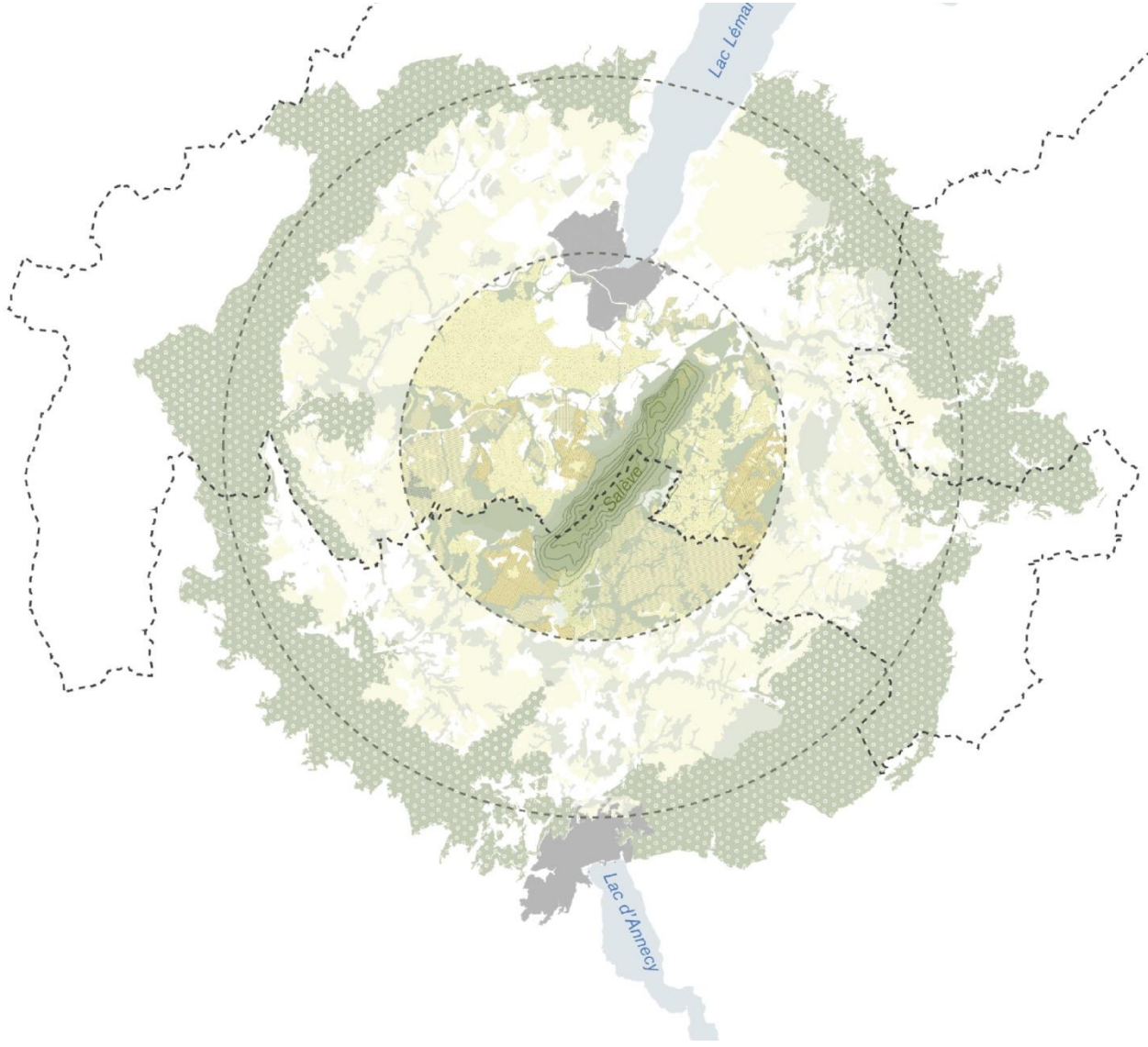
Figure 12. Mean zero-degree height calculated using radiosonde data and surface station data from the Swiss Network of Surface Stations (see text). The offset is due to a different definition (see text). Surface stations time series starts in 1961.

Source: E. Brocard et al. (2012)

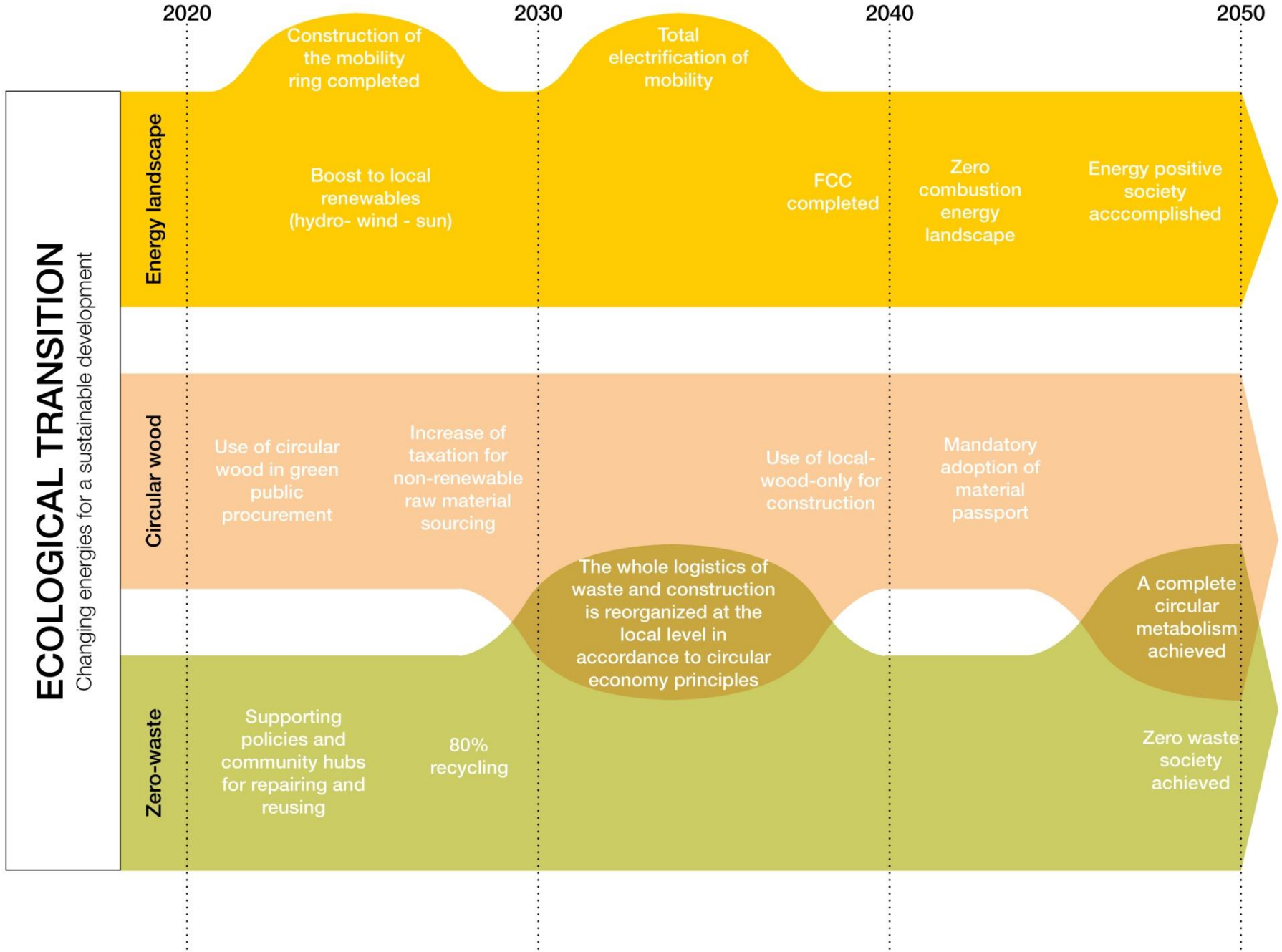
Towards a Nature-Based Metropolis

Climate is already changing cities, but cities as well can change climate through design, contrasting micro-climate condition at the local level

Putting **Nature at the centre** of the planning system both metaphorically and geographically



2020
2030
2040
2050
SOCIETAL TRANSITION
Changing life-styles for living and working
ECOLOGICAL TRANSITION
Changing energies for a sustainable development
Housing infilling
Giving up single-family housing models for new construction
Zero soil sealing
Densification of construction around the ring and on the 11 poles
High-density housing integrated with nature is acccomplished
Smart working
Supporting policies for agile and smart working
Developing metropolitan smart tele-conferencing hubs on the 11 poles
Reduction of private mobility demand by 50%
Mobility as a service
Policies for promoting mobility as a service and light transport solutions
Private fossil-based mobility banned from the metropolis
Mobilty as a service acccomplished
Construction of the mobility ring completed
Total electrification of mobility
Energy landscape
Boost to local renewables (hydro- wind - sun)
FCC completed
Zero combustion energy landscape
Energy positive society acccomplished
Circular wood
Use of circular wood in green public procurement
Increase of taxation for non-renewable raw material sourcing
Use of local-wood-only for construction
Mandatory adoption of material passport
The whole logistics of waste and construction is reorganized at the local level in accordance to circular economy principles
A complete circular metabolism achieved
Zero-waste
Supporting policies and community hubs for repairing and reusing
80% recycling
Zero waste society achieved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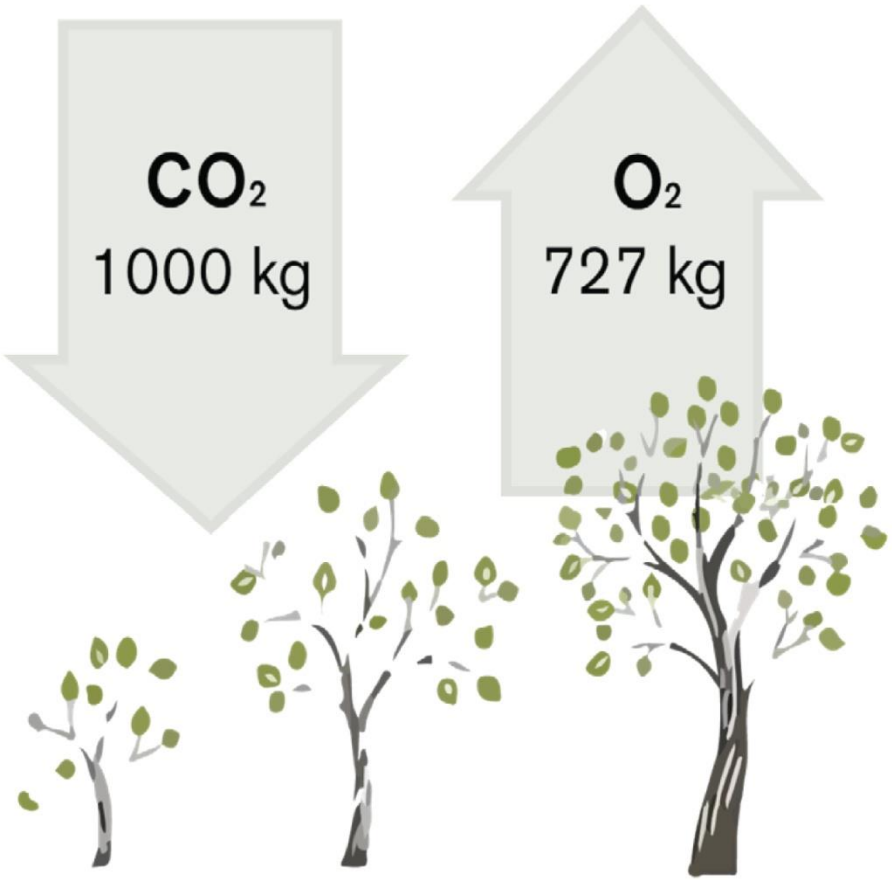
The structure of the Tamedia Office Building, in Zurich, is realized with 2000 m3 of wood.

On average a typical tree absorbs, through photosynthesis, the equivalent of 1 tonne of carbon dioxide for every cubic metre's growth, while producing the equivalent of 727kg of oxygen.

ECCM (Edinburgh Centre for Carbon Management)

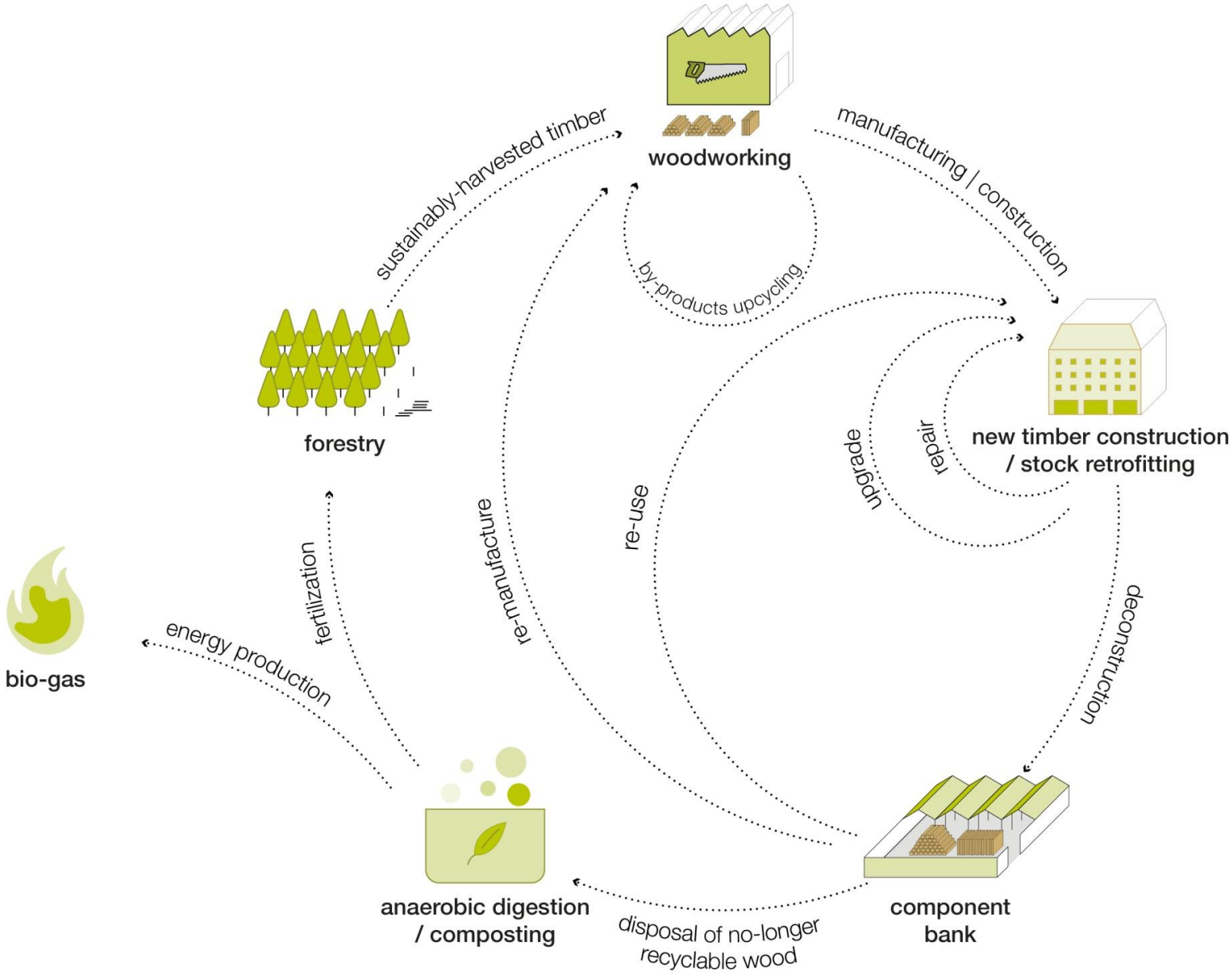


Photosyntesis:

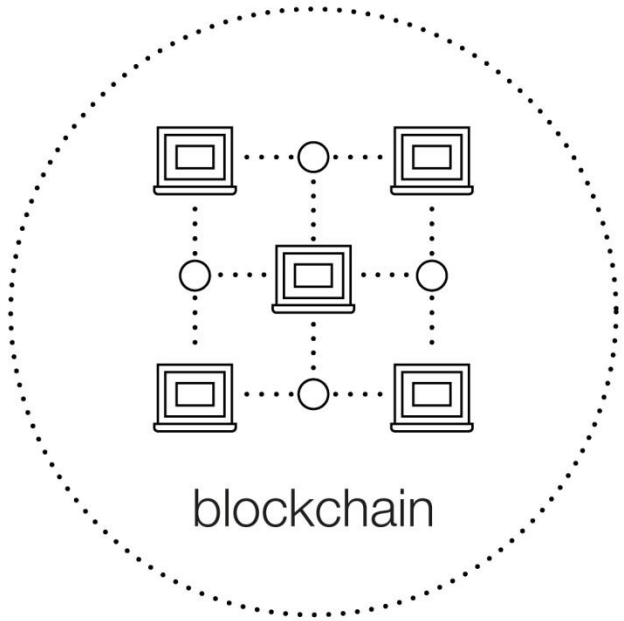
$$6\,[\,CO_2 + H_2O] \longrightarrow C_6H_{12}O_6 + 6\,O_2$$

1 m^3 growth

Circular wood construction




material passport


blockchain

Achieving a **carbon positive** environment is an ambitious target. From a technological point of view, the target is **feasible with solutions already available today**. The challenge is rather societal, in terms of acquisition of financial resources and their fair distribution over the territory.

Grazie!

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