Sesame : a decision-making tool to improve the greening of our towns and cities

COP 28 – Dubaï - 1er décembre 2023

Sesame

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Cerema
CLIMAT & TERRITOIRES DE DEMAIN

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Presentation Outline :

Cerema
CLIMAT & TERRITOIRES DE DEMAIN

- 0. A brief introduction to Cerema (in French!)
- I. Project background and objectives
- II. Services and constraints considered in Sesame 13
- III. Choice of species for the database
- IV. An application for urban greening professionals
- V. Progress, limits and prospects

CEREMA – WHO WE ARE

- **L'agence publique de référence en France**
  - **À l'appui des politiques publiques de l'aménagement des territoires, des mobilités, de l'adaptation au changement climatique et des transitions**
  - **Sous la tutelle des ministères en charge de ces questions**
- **Plus de 2 500 agents répartis sur 27 implantations sur le territoire national et ultramarin (Antilles-Guyane et Océan Indien)**
- **250 M€ environ de budget en 2022, un CA de 43 M€ la même année.**
- **Une nouvelle dynamique stratégique depuis 2021 :**

  l'adaptation au changement climatique comme boussole des activités

« Tant que le climat changera, le Cerema agira »

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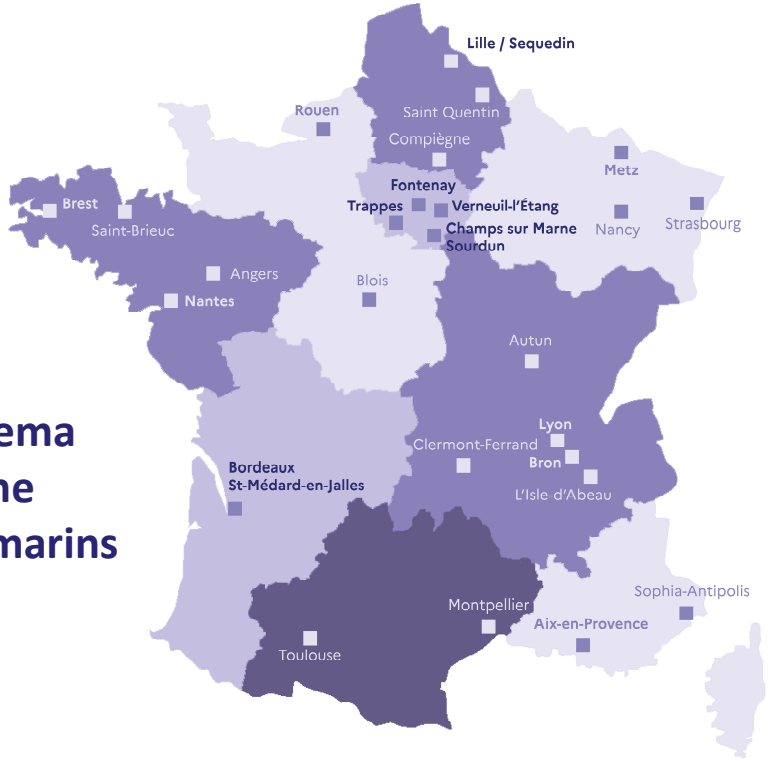
Les implantations du Cerema en France métropolitaine et dans les territoires ultramarins



LA RÉUNION - MAYOTTE GUADELOUPE - MARTINIQUE - GUYANE

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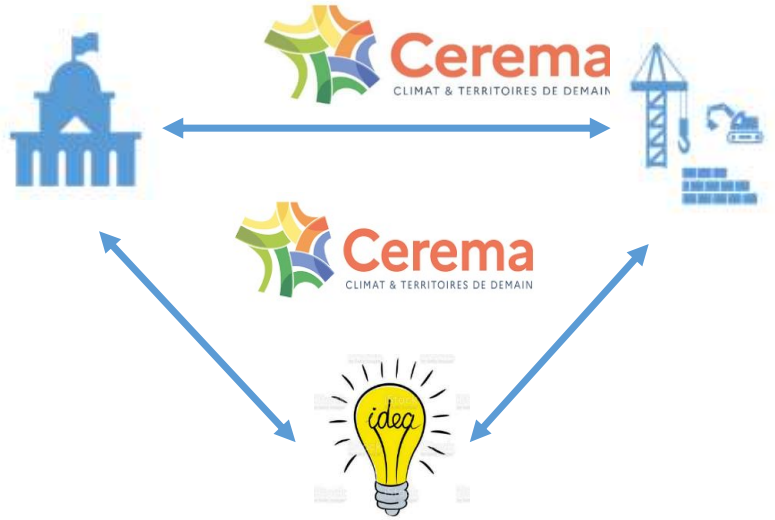

Tiers de confiance pour les acteurs publics et privés via 4 modalités d'intervention :

- Des expertises et une ingénierie de haut niveau tournées vers le Pacte Vert
- L'innovation pour les politiques publiques au service des usages, des besoins et du bien-être des citoyens
- Une recherche opérationnelle : 12 équipes de recherche, plus de 120 projets en cours avec un haut niveau d'opérationnalité des projets portés
- Des méthodologies et des états de l'art reconnus (plus de 3000 publications), des formations à destination de nombreux acteurs publics et privés

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OUR SIX AREAS OF EXPERTISE :

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I. Project background and objectives

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A partnership with three structures:

DÉPARTEMENT BOUCHES-DU-RHÔNE

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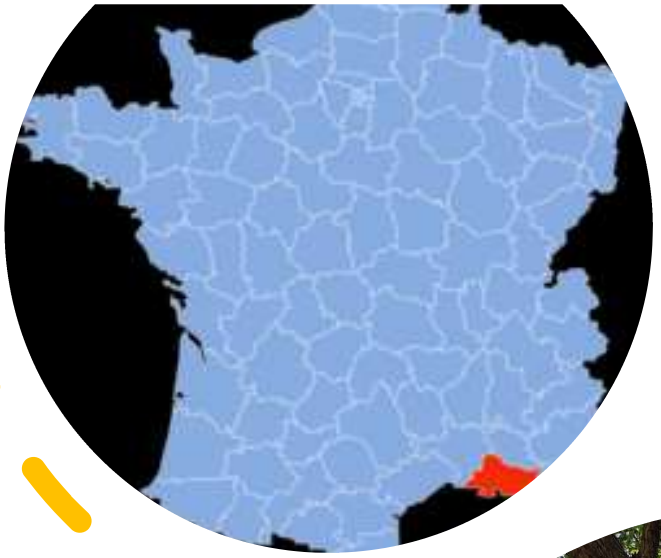
INRAE

Villa Thuret
Jardin Botanique

Département des Bouches-du-Rhône



- A desire to encourage the emergence of urban nature projects as part of the Department's Environmental Agenda.
- Nature-based Solutions Delegation
- In the applications submitted by Communes under the "Provence Verte" scheme, greening projects are sometimes motivated solely by aesthetic considerations, without any long-term environmental thinking.

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Cerema *an interdisciplinary scientific and technical resources Centre, placed under supervision of the ministries in charge of ecological transition, sustainable development, town planning and transportation.*

- A partner at the heart of a regional dynamic
- Climate, a compass for its action in its 6 areas of expertise
- Sésame, a local approach to greening the city, adapted to the climatic, ecological and cultural context of a given area.
- Sésame has a dozen or so variations throughout France (Eurométropole de Metz, Bordeaux Métropole, Conseil Départemental de la Seine Saint Denis, Paris, Libourne .... etc.), considering the different climatic zones of the country.

Unité expérimentale Villa Thuret – INRAE

Villa Thuret has been a research site dedicated to botany and acclimatization since 1857

- **Acclimatisation mission: introduction, cultivation, accommodation and study of wild plant species, mainly exotic, since 1857.**
- **Botanical garden on Cap d'Antibes, open to the public: 3.5 ha - One thousand woody species in collection + traceability, herbariums and archives on historical species. Permanent renewal**
- **Participation in various scientific programmes, infrastructures and networks**
- **Inventory and monitoring database**
- **ARDEM (= Trees of Tomorrow) database and species sheets accessible on the Villa Thuret website.**

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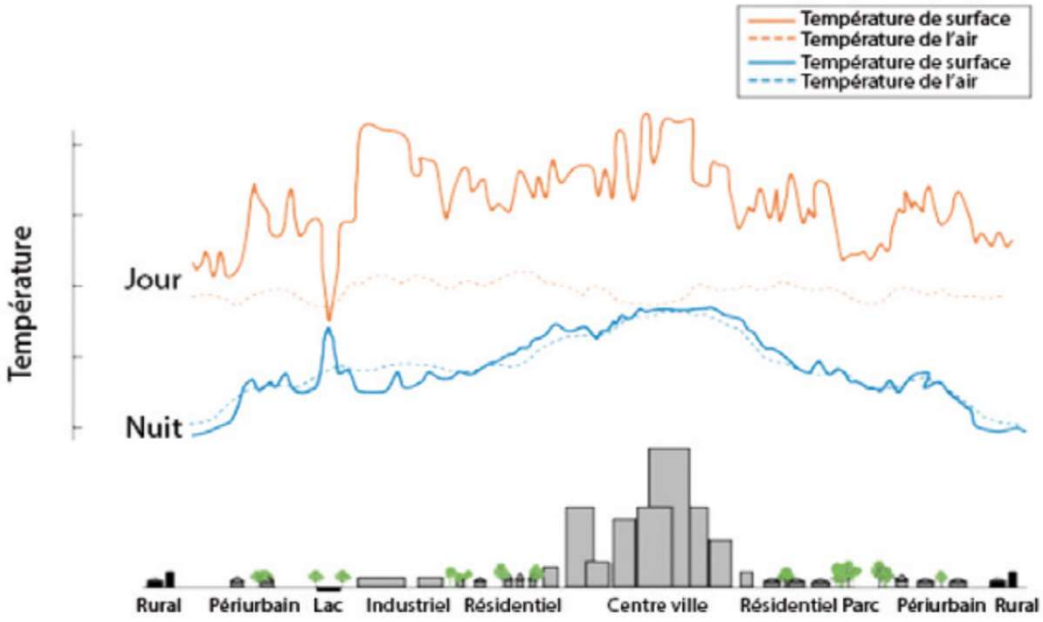
Urban heat islands in the future



More pronounced on summer nights

Global warming should accentuate the phenomenon (more heatwaves)

A phenomenon that also exists in winter, albeit to a lesser degree

If we consider an increase of +2°C in the minimum temperature in winter in dense urban areas:
Currently, for zone of Marseille: conditions in the city centre would be more like those in the countryside of Toulon, Nice, Calvi, Perpignan, Santiago de Chile?

In future projections, it would be more like the countryside in Valencia, Palermo or even Algiers, Tunis, Tangiers, Los Angeles, Adelaide, etc.

What is Sesame ?

- EcoSystemic Services provided by Trees Modulated by Species (*Services EcoSystémiques rendus par les Arbres Modulés selon l'Essence*)

- Adaptation to the Bouches-du-Rhône (south of France) context of the methodology implemented by Cerema in Metz (north of France).
- A tool to help design urban greening projects:

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Audience targeted by Sesame 13

- Local authority technical services, the Bouches-du-Rhône Department's business/skills sector, and any planning body interested in urban greening issues.
- The tool will be freely available to all.

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The Users Committee, a privileged forum for discussion with future Sesame 13 users:

- Gathering user needs and opinions
- Design and test the tool with SESAME users
- Connection with reality on the ground

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II. Services and constraints considered in Sesame 13

What are the ecosystem services?

- The concept of ecosystem services has been around since the 1970s: originally, it originated in the world of conservation and focused primarily on ecosystem degradation (Ehrlich and Mooney, 1983; Gómez-Baggethun et al., 2010; Barnaud et al., 2011).
- This concept has been widely disseminated since the Millennium Ecosystem Assessment (MEA) in 2005.
- It refers to the benefits that humans can derive from the functioning of ecosystems.

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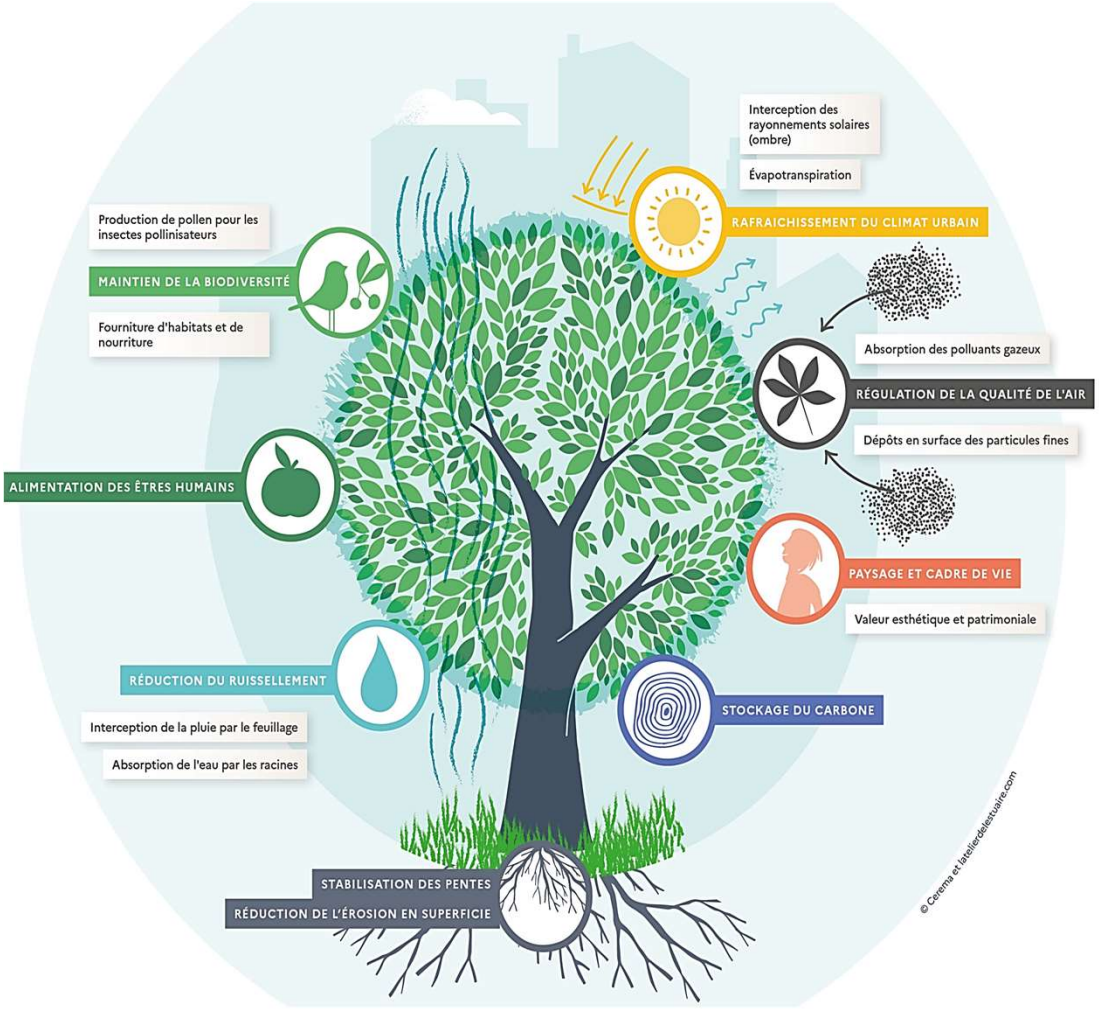
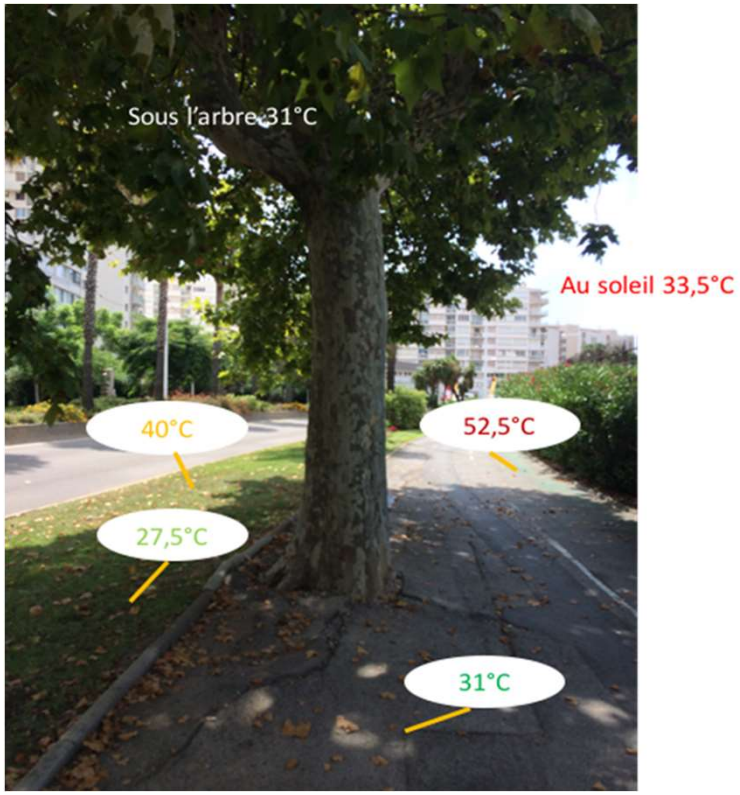
The urban tree, shrub …

- Trees and shrubs provide services that are not well known to the public or to developers. These services vary greatly from one species to another.
- Tree and shrub species are more or less adapted to the local climate, to the difficulties of the urban climate and to the expected constraints of climate change.
- Trees and shrubs also represent constraints (allergenic pollens, dimensions, etc.) that need to be taken into account.



Source : Sesame Metz

EXAMPLE OF A URBAN TREE SERVICE : REGULATION OF LOCAL CLIMATE



Example of temperature records :

In Toulon town centre, grass in the sun is 40°C and tarmac in the sun 52.5°C, while in the shade of a tree the surface temperatures are 27.5°C and 31°C respectively.

Source Profil climatique de la ville du Pradet (Acterra, 2018)

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How does Sesame work ?

With Sesame tools it is possible to :

- Estimate the services provided in the city by the plant species entered in the database,
- Identify the species best suited to the user's greening project,
- Identify the constraints posed by the different species.


Landscape and quality of life

Landscape and quality of life

space typology

- **Areas typology**

- Main thoroughfare
- Ring road
- Car park
- Intermediate space
- Square
- Small square
- Urban park
- Path
- Quay and bank
- Pool and storm basin
- School playground
- Cemetery
- Seaside and pond

Provided services

Prioritisation based on 4 landscape services

- **Structuring the area**
- **Animating the space**
- **Providing comfort**
- **Symbolising**

Species

List of plant species

Cedrus atlantica
Celtis australis
Tilia platyphyllos
...


Regulation of local climate

Regulation of local climate

Criteria assessed, partly linked to shading

Tree size
Width of crown
Minimum leaf size
Maximum leaf size
Tree habit
Leaf shape
Foliage density
Leaf roughness

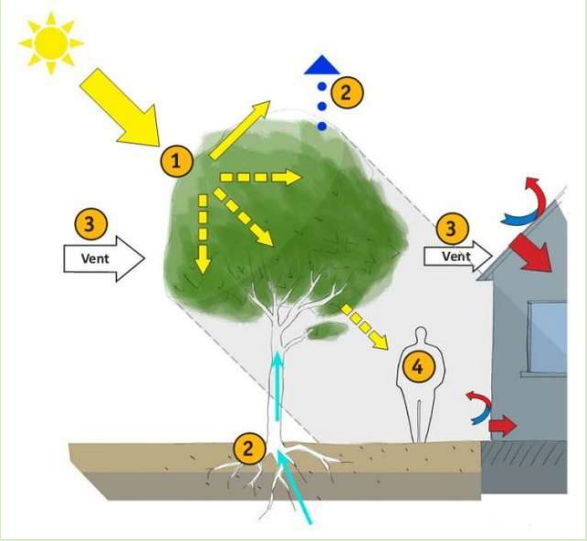

Diagram describing how a tree works and the different mechanisms for regulating the urban climate(VegDUD – 2014)


Biodiversity
Chevêche d’Athéna,
Athena noctua

Biodiversity approach

Wikipedia

Citron de Provence - Gonepteryx cleopatra

Food resource

Breeding site
Shelter
Perch

Rex, Wikimedia commons

Nid d'oiseau - bird's nest

Biodiversity

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Pyracantha, source de nourriture hivernale

Winter food

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Tilia platyphyllos

Attractive species for pollinators

Biodiversity

Criteria assessed	
Native or non native character	Biodiversity indicator
Recommended by local biodiversity guides	
Ability to host insects	
Plant of interest to pollinators	
Edible for avifauna and medium-sized fauna	
Ability to generate pollen and nectar	
Of interest to lepidopterans (biomass)	
Ability to create habitats and act as a host plant	
Ability to create cavities	
Phenological lag compared with other species	


Air quality regulation

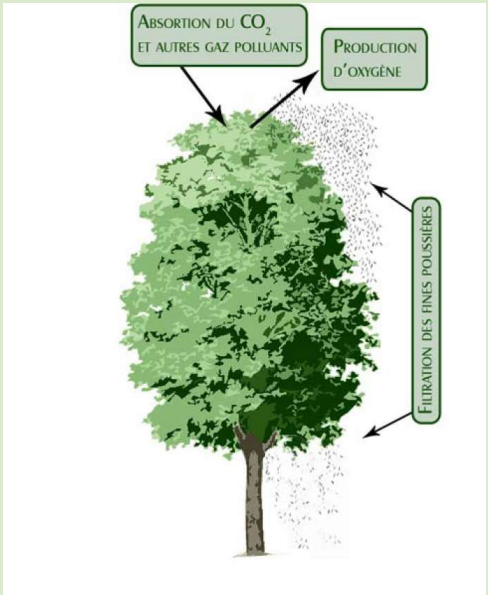
Air quality regulation

Criteria assessed

Foliage persistence
Leaf roughness
Coniferous/leafySize (height)

Width of crown
Minimum leaf size
Maximum leaf size
Tree habit
Leaf shape
Foliage density

} Leaf area



1 Société de l'arbre du Québec. 1998. *Des arbres pour vivre en santé. Guide pour la réalisation de projets de plantation.* Québec. 20 p.

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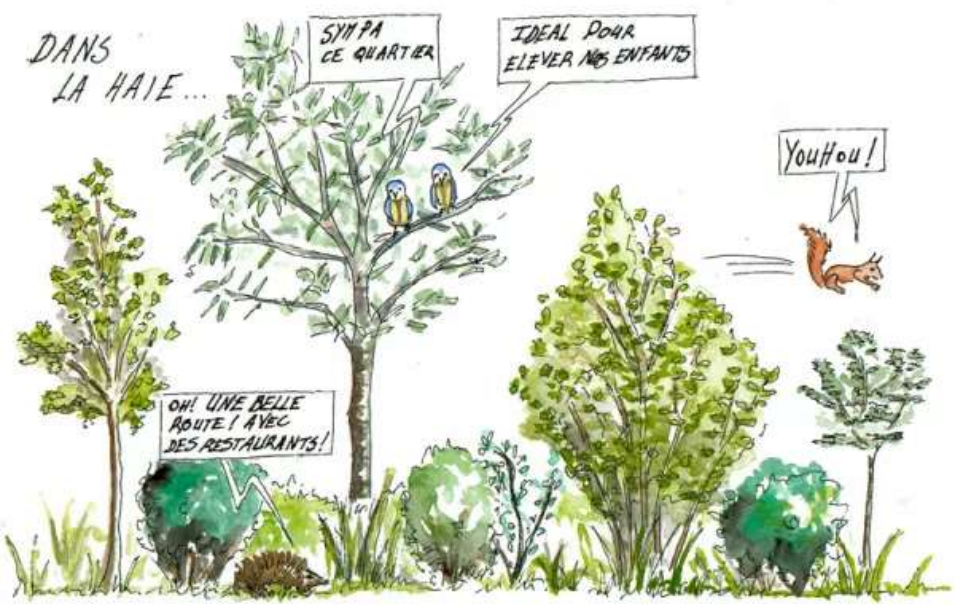
The concept of a species bundle approach to optimise the chances of planting success



© Clotilde GARNIER / dessin-nature.com

- the bundles are separate from the tool in the species sheets, which include the plant communities adapted to the same soil conditions
- This is a qualitative approach, as the criteria need to be cross-referenced without losing sight of the overall effect of the bundle, in phyto-sociological, ecological and landscape terms: the bundle must "make sense".

Constraints considered ?

Some examples :

- Toxic fruits ;
- Allergenic pollen ;
- Roots damaging coatings ;
- Honeydew production ;
- Flammability
- Etc …

The constraints are filled in for each species in the database and listed in the species sheets.

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III. Choice of species for the Sesame 13 database

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Drawing up a species list

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- *Choice based on criteria to meet current and future challenges*
  - Adaptability to more severe droughts
  - Hardiness (increase in the number and intensity of climatic events)
  - Avoidance of invasive exotic species
  - Limited number of protected species
  - At this stage, health constraints are not eliminatory

- *A range of species to meet different landscape needs*
  - Native species
  - Exotic species: elimination of species that are known to be invasive.

List of species

- Diversity of plant types to form "species groups":

Choisya ternata
Bush

Types	Native species	Non native species
Trees	40	60
Shrubs	30	18
Bushes	51	25
Vines	4	14
Total	52 %	48 %

Wisteria sinensis – Vine

Myoporum laetum
Shrub

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IV. An application for urban greening professionals

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Web application development and commissioning:

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Web application development and commissioning:

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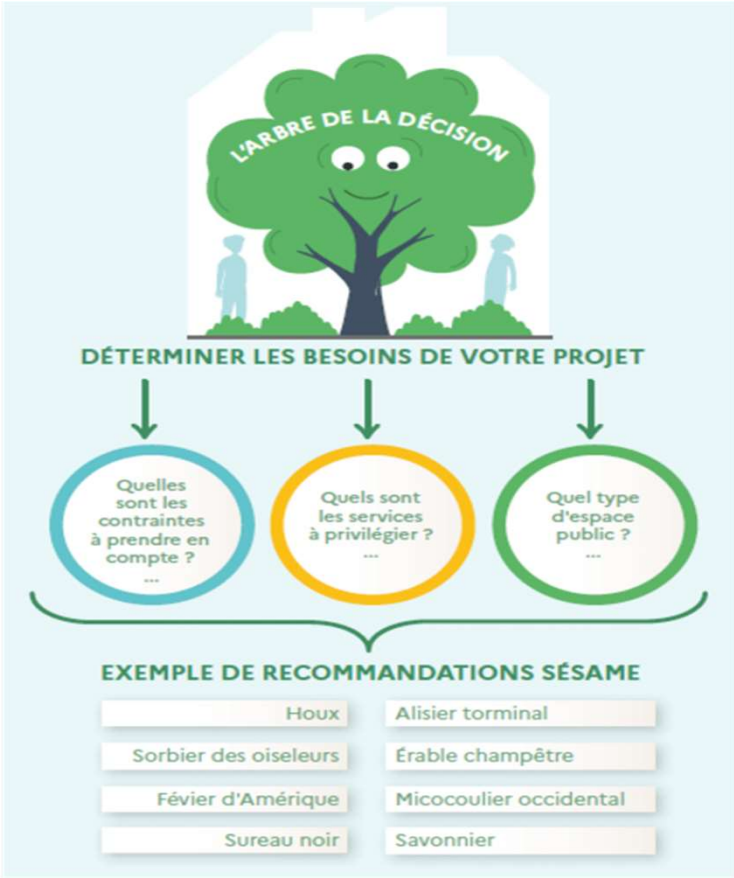
Sesame



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Web application development and commissioning:

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Les différentes étapes d'utilisation :

1. Je déterminer les besoins et les contraintes du projet
2. Je choisis les services écosystémiques à privilégier
3. Je précise le type d'espace public que je souhaite aménager
4. Je lancer la recherche et obtiens une liste d'espèces adaptée aux enjeux

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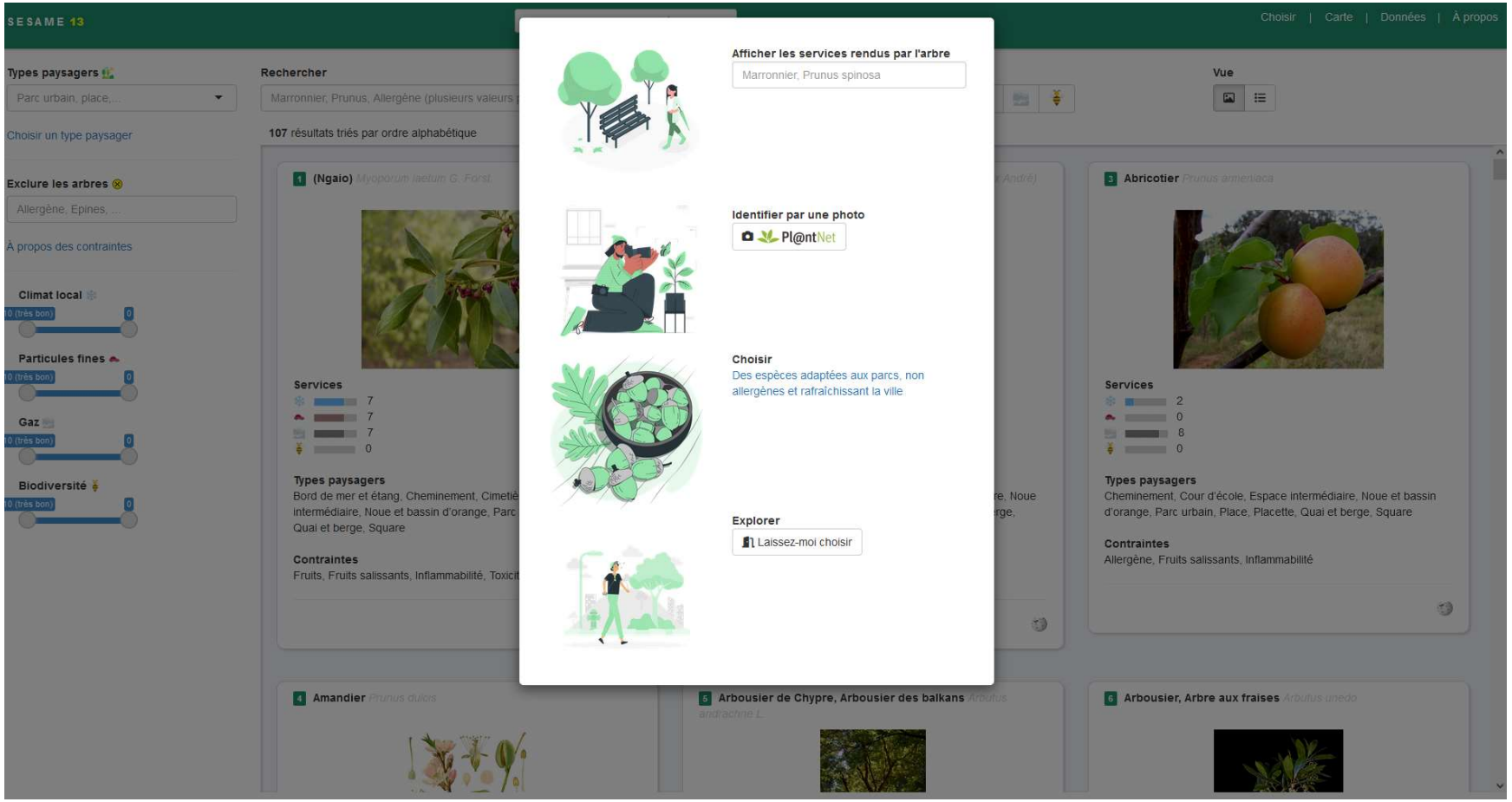
Sésame 13 application test : https://cerema-med.shinyapps.io/sesame-alpha/



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V. Progress, limits and prospects

Project schedule

Step 1
- Adaptation to the Local context
- 2022

user committee (12 mai 2022)

Step 2
- Definition of relevant and prioritised ecosystem services; choice of tree and shrub species
- 2022

user committee (24 juin 2022)

Step 3
- Filling in the database
- 2022 - 2023

user committee (27 juin 2023)

Step 4
- SESAME local finalised and online
- 2023

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Sesame 13: help, but not a panacea

Sesame 13, is:	Sesame 13, isn't:
- A tool to help design greening projects - Help in finding the right plants for the user's project, in a context of climate change - A reliable database, supplemented by experts - Informative species sheets - A web application that is accessible to all, but designed for greening professionals	- A turnkey tool for drawing up plans for a greening project. The expertise of landscape architects and planners is still essential for sketching out a project. - A tool for identifying the perfect species. Each species has its strengths and weaknesses, depending on the context of the project! - Does not check the availability of nursery plants.

Sésame Metz application test

https://sesame.cerema.fr/

Thanks for your attention
Merci pour votre attention !

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