

UM 6 P | SOLE
Student Organizations,
Leadership & Engagement

SAP+D

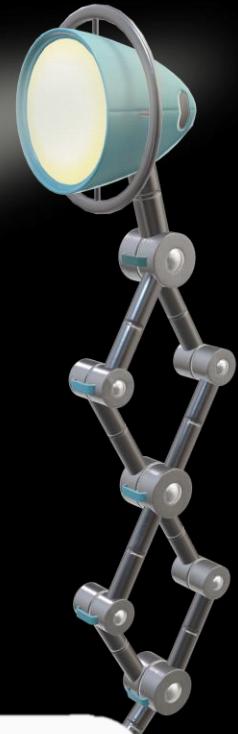
ARCHI+TECH
ARCHITECTURE TECHNOLOGY CLUB

SUNTOWER

TEAM 8 : POWER RANGERS

LOCAL
DOMOTICS
COMPETITION

IV EDITION



SOMMAIRE

- 01** CONTEXTE
- 02** CONCEPT ARCHITECTURAL
- 03** SYSTÈME FONCTIONNEL
- 04** EMBEDDED SYSTEMS & AI
- 05** AMBIANCE



01

CONTEXTE

AFRICA : TOWARDS A SUSTAINABLE



Think food, disasters and survival

Out of Africa – the future of global food security

Africa is often seen through the lens of food insecurity, but a quiet revolution is underway. Professor Chris Elliott explores how the continent could become a global food powerhouse.

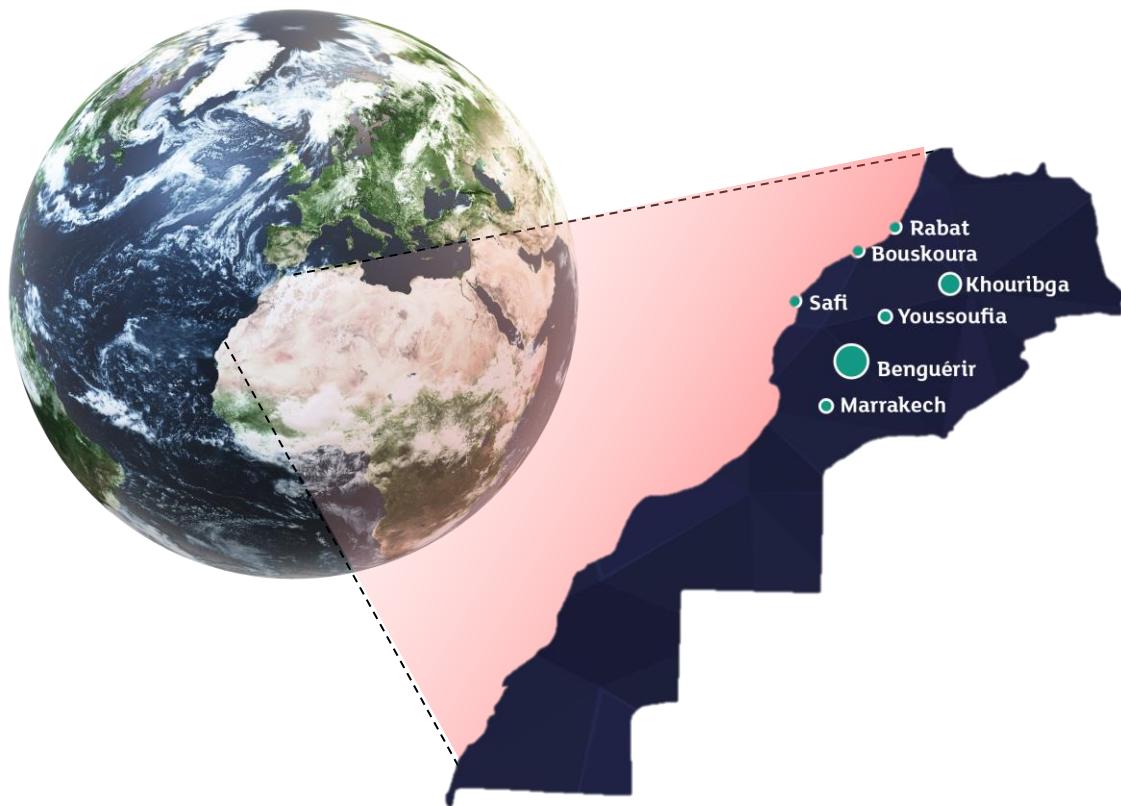
West and Central Africa faces deepening food crisis - UN agencies call for enhanced humanitarian action and lasting hunger solutions



01

CONTEXTE

BENGUERIR : LA VILLE VERTE



01

CONTEXTE

BENGUERIR : LA VILLE VERTE



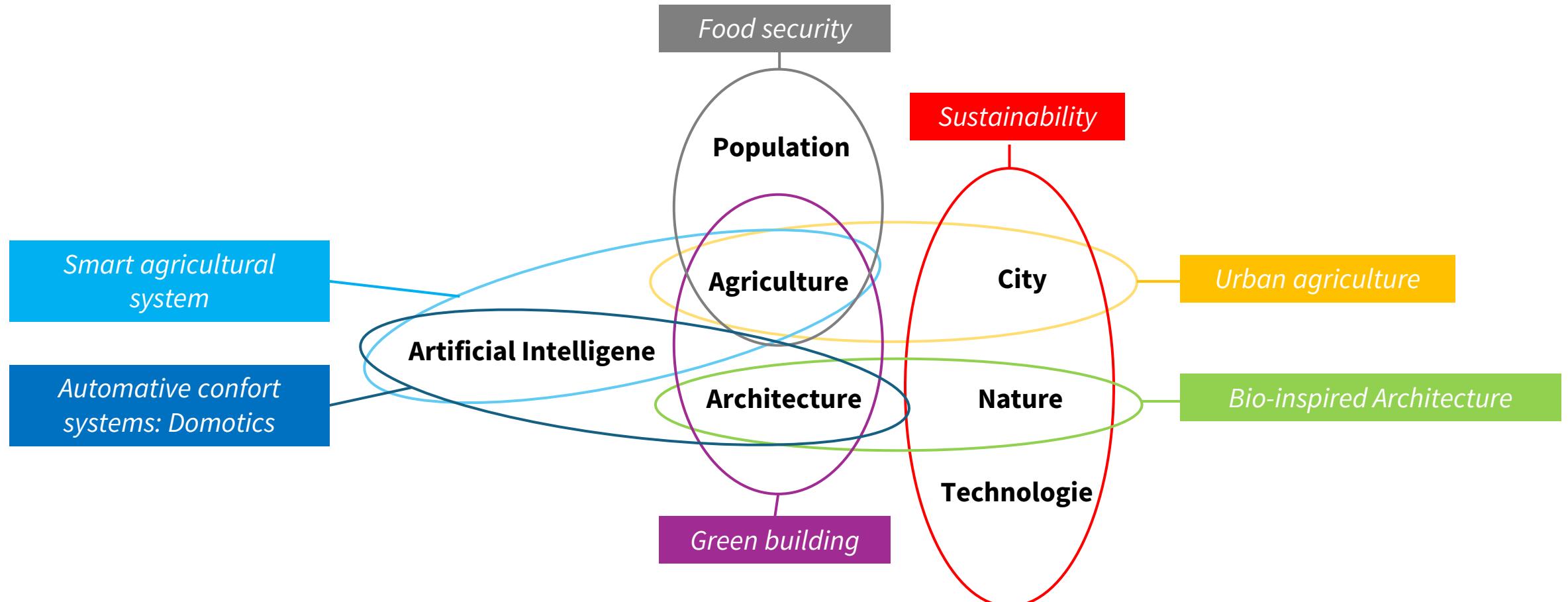
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SUNTOWER PROJECT

**IDEATION OUTLINE**

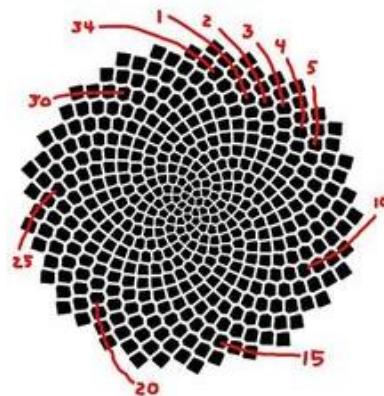
Multiscalar & Multidisciplinary Approach



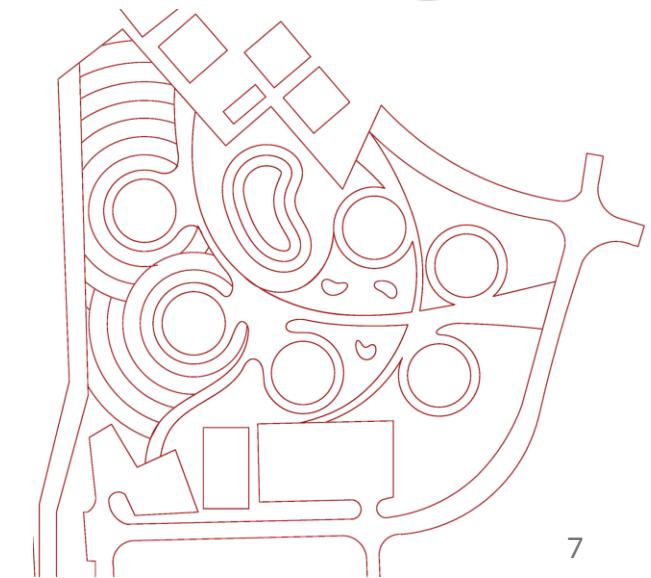
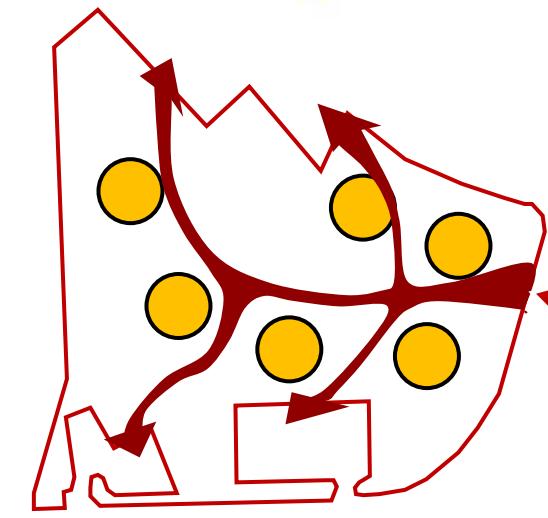
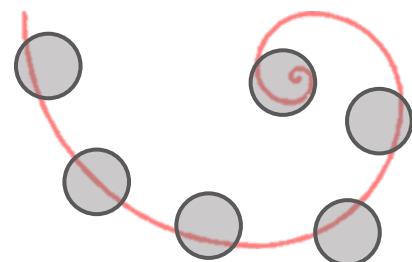
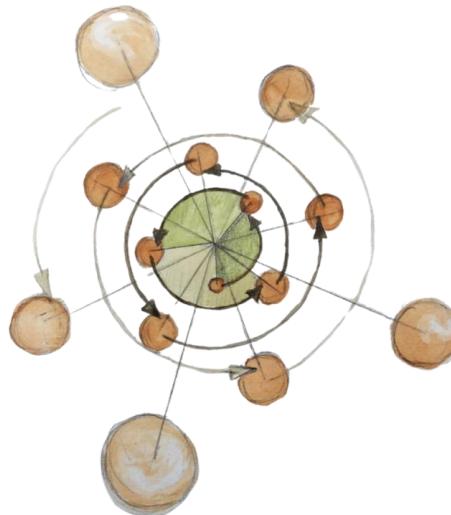
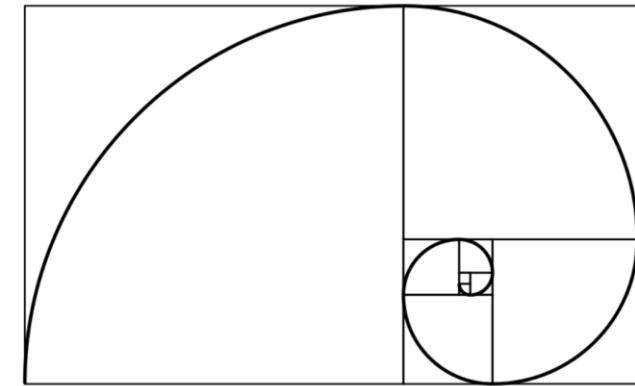
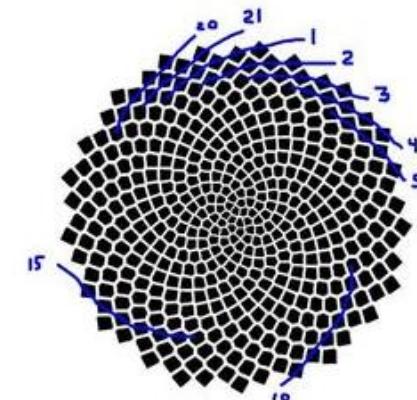
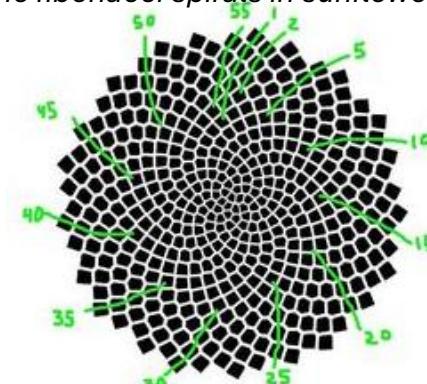


MASTERPLAN DEVELOPMENT

Fibonacci spiral – The golden ratio



The fibonacci spirals in sunflower



02

THE SUNTOWER BUILDING

MASTERPLAN

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LEGENDE

- a - Jardin communautaire
- b - Bassin de rétention végétalisé + Panneaux solaire rotatifs
- c - Jardin communautaire
- d - Terrain de Tennis
- e - Parkings
- f - Bosquet d'arbres
- ▷ Accès



JARDIN COMMUNAUTAIRE

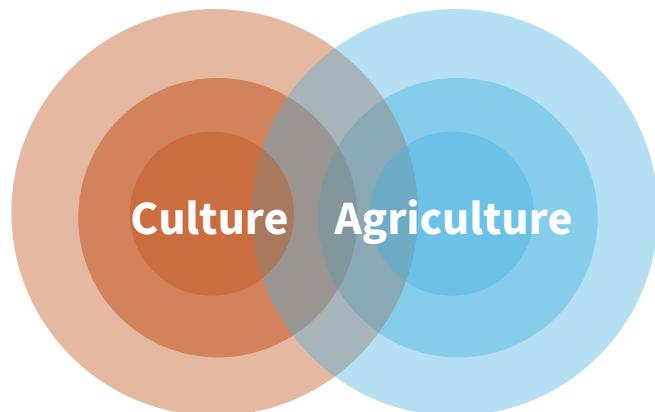
AUTOMATISATION DU REMPLISSAGE
DES OYAS

Oyas + irrigation goutte-à-goutte

Une solution fondée sur la nature

Les oyas sont des pots en céramique microporeuse qui sont enterrés près des plantes et remplis d'eau. Ils libèrent progressivement de l'humidité au besoin. Les plantes n'absorbent que l'eau dont elles ont besoin.

Économies d'eau très importantes (50 à 70 %).



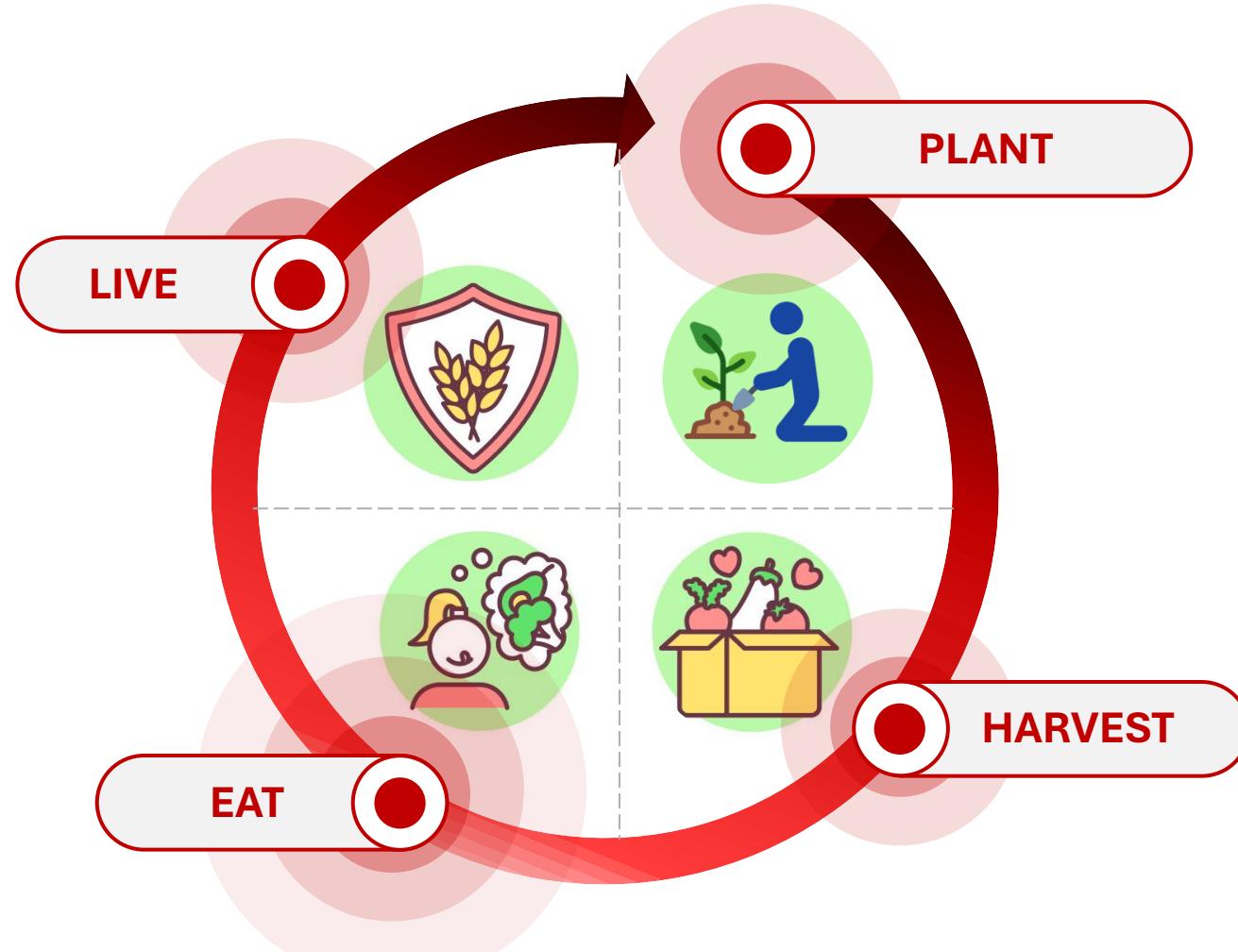
ARROSER SANS GASPILLER



02

CONCEPT

COMMUNITY GARDEN



**COMMUNITY GARDEN**

Cycle de compostage





Rotating building for sun-oriented productive balconies

Sunflower
Photosynthesis

Natural Behavior: heliotropism



Rotation

**Maximise l'apport de lumière
tout au long de la journée**

SUNTOWER PROJECT

SunTower

Conception réactive (Responsive design)
Données environnementales en temps réel



Bâtiment intelligent
Systèmes de suivi solaire
Assistance vocale
Algorithmes d'automatisation des bâtiments (domotique)
Capteurs (Base de données centralisée – Monitoring dashboard)
Système de sécurité et d'alerte d'urgence



Expérience biophilique
Santé des végétaux
Confort thermique
Sécurité alimentaire



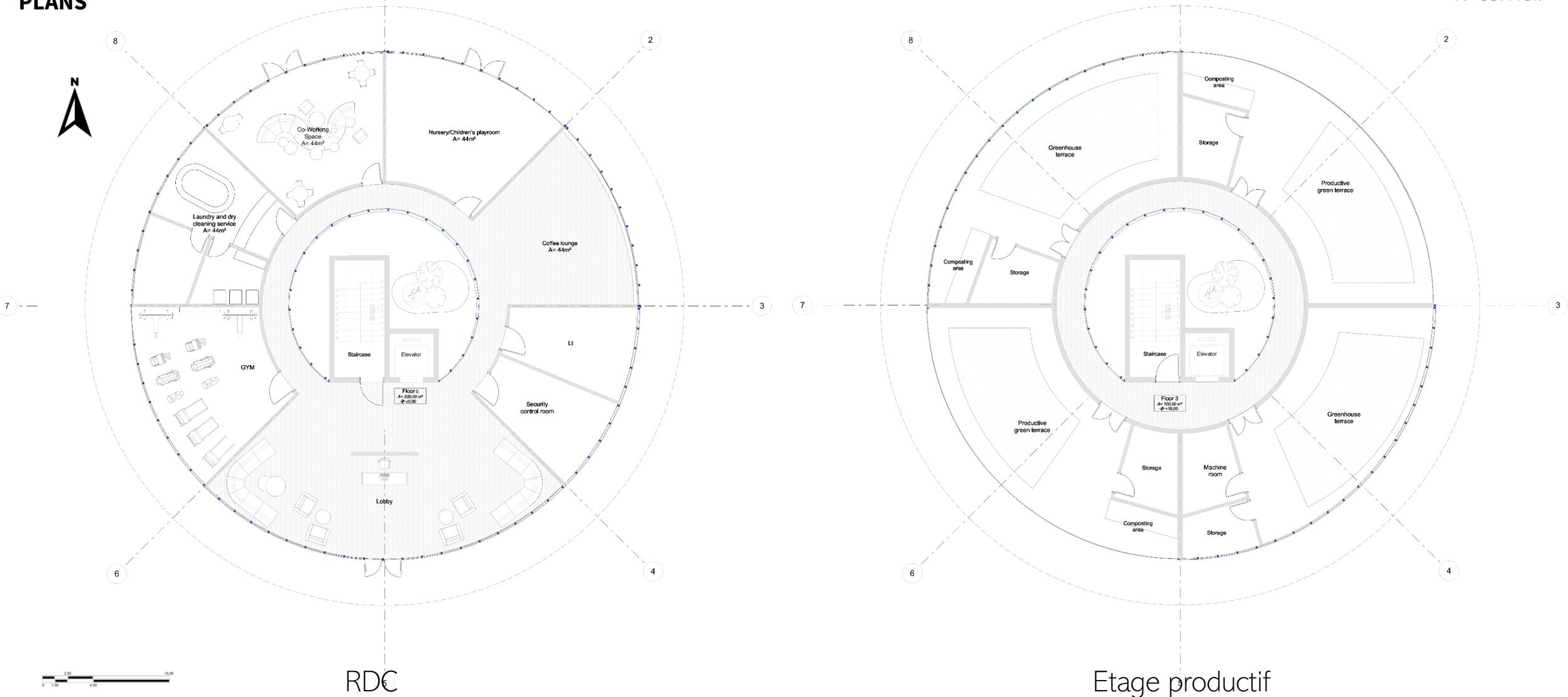
02

THE SUNTOWER BUILDING

PLANS



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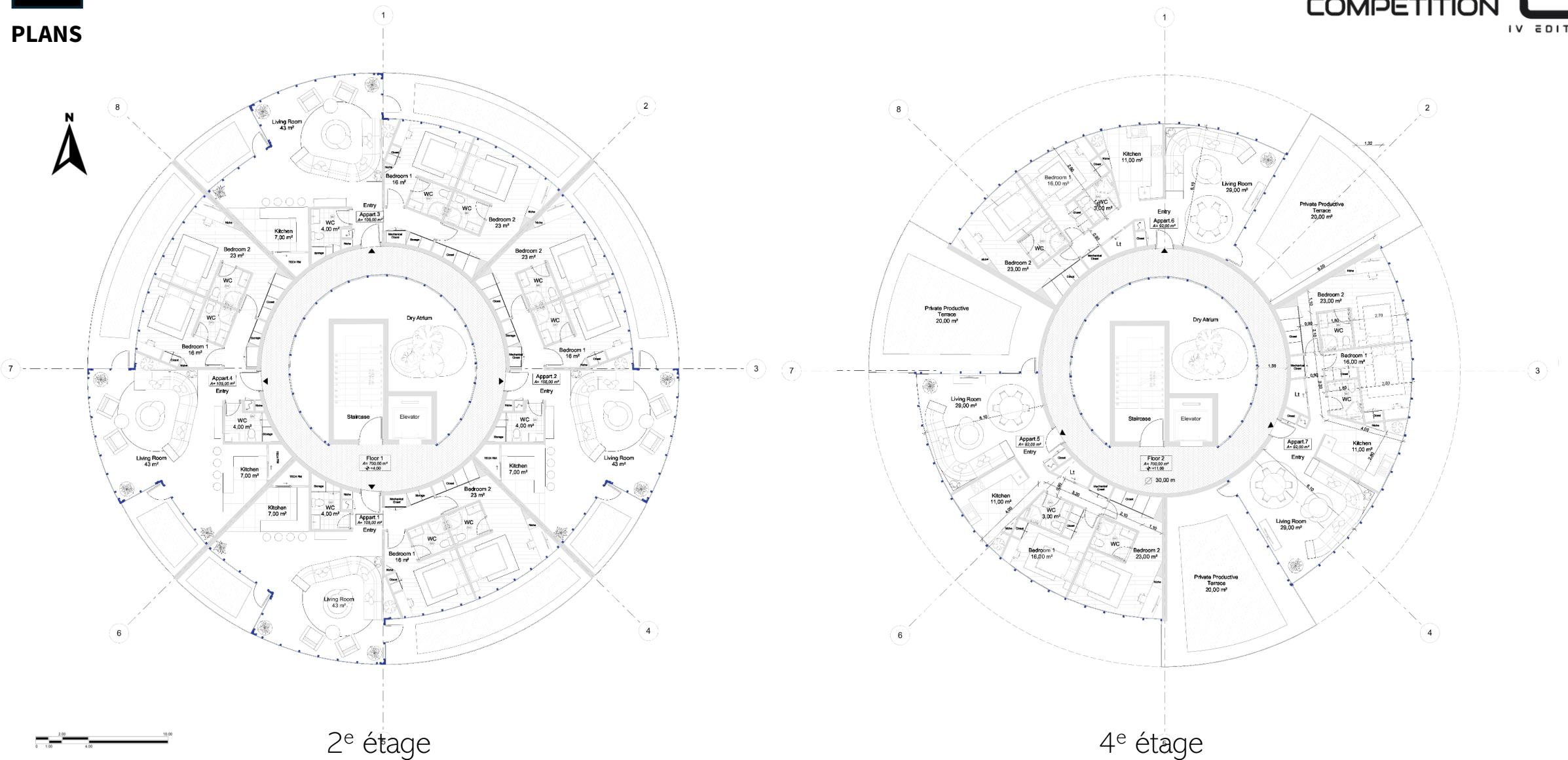
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PLANS



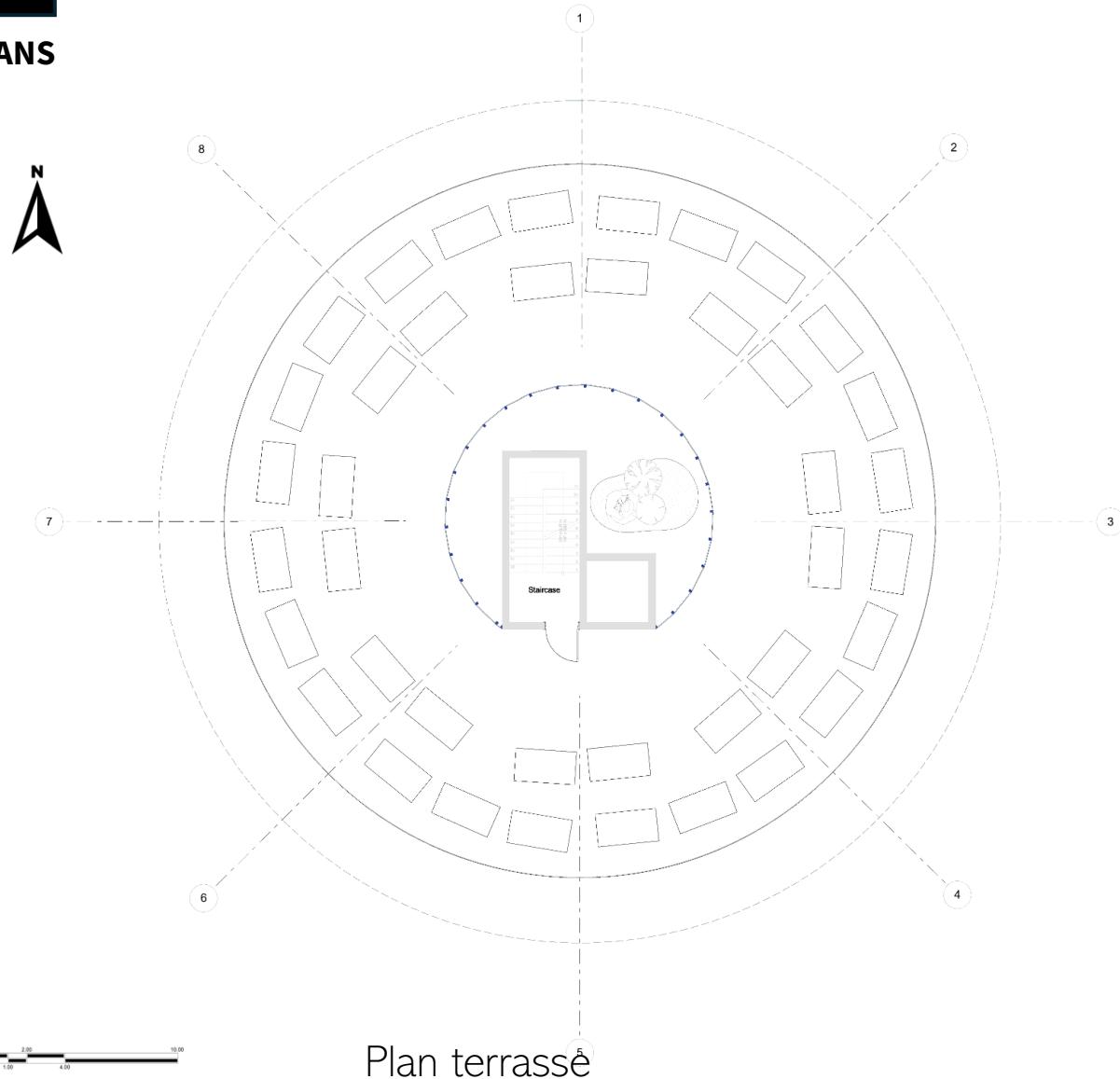
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02

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PLANS



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02

THE SUNTOWER BUILDING

AXONOMETRIE

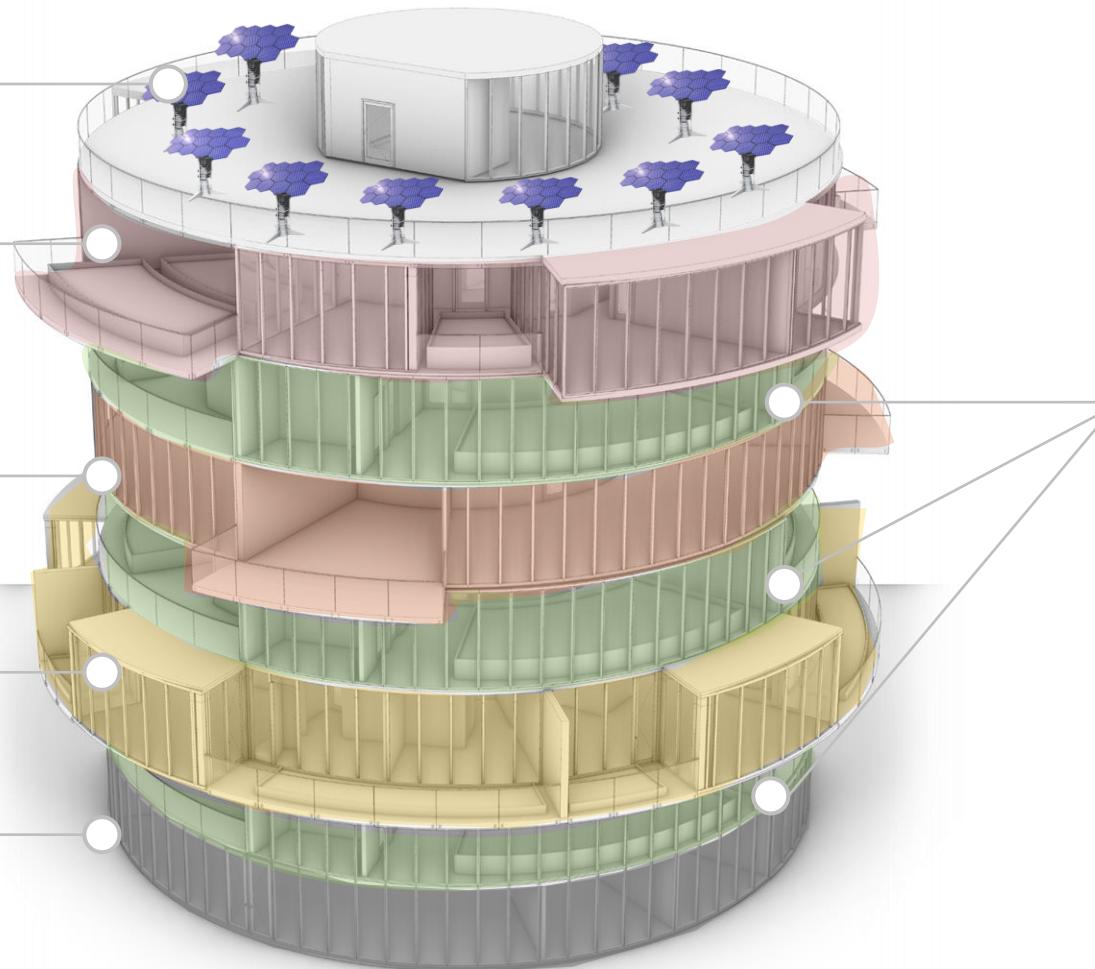
Solar terrace

Habitable floor 01

Habitable floor 02

Habitable floor 03

Multi-functional
Ground floor



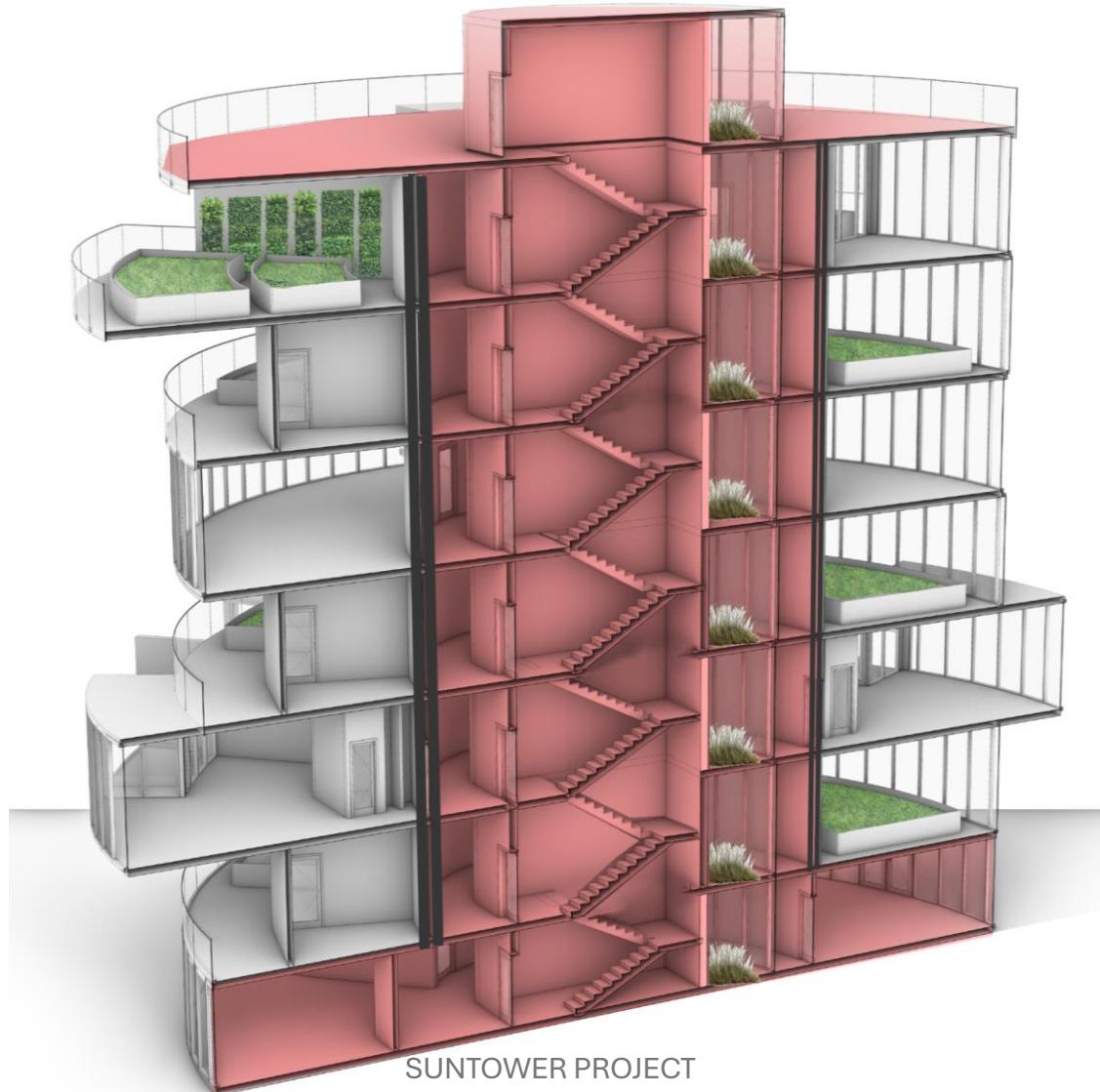
03

SYSTÈME FONCTIONNEL

COUPE 3D



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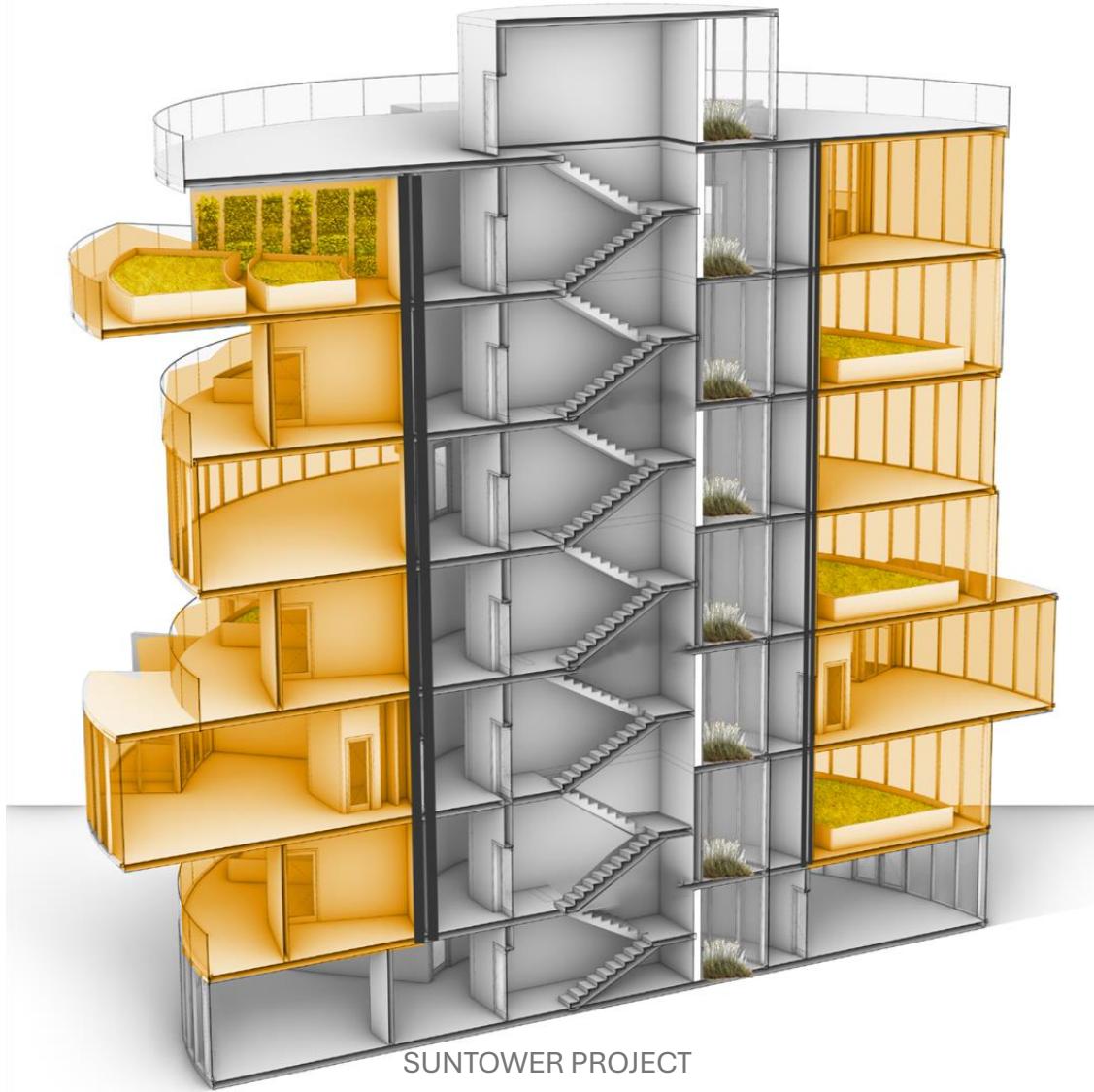
03

SYSTÈME FONCTIONNEL

COUPE 3D



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03

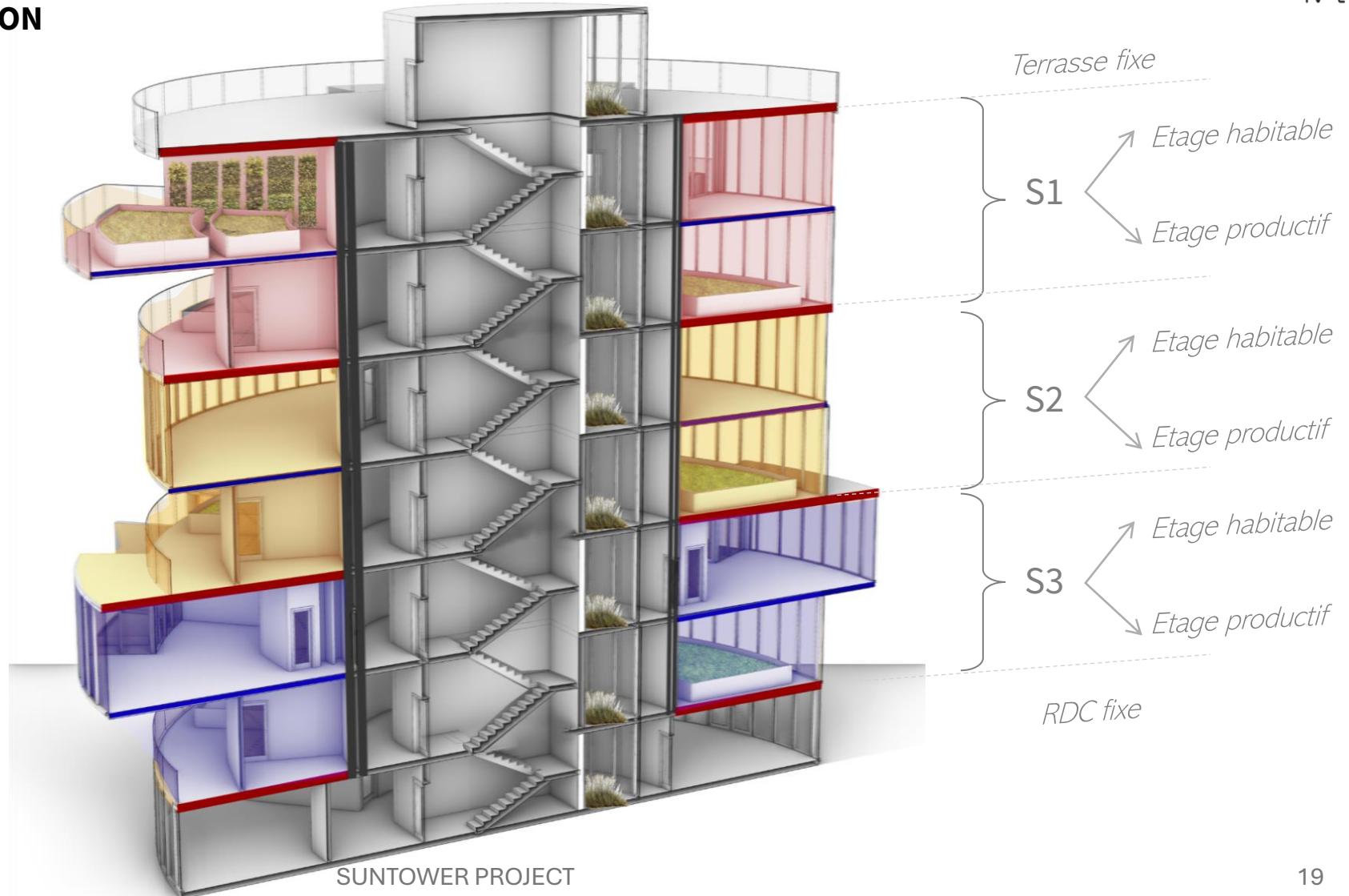
SYSTÈME FONCTIONNEL

ELEMENTS DU SYSTÈME DE ROTATION

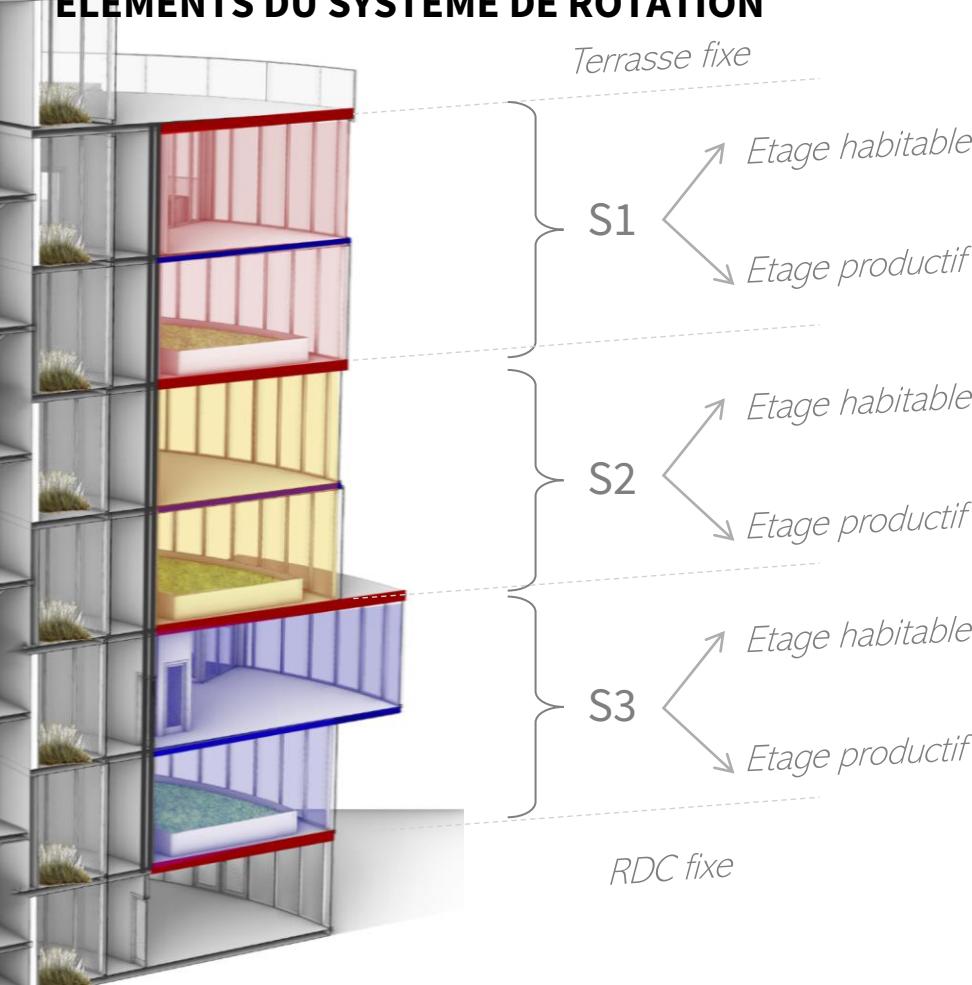
LEGENDE

Liaison rotule

Encastrement

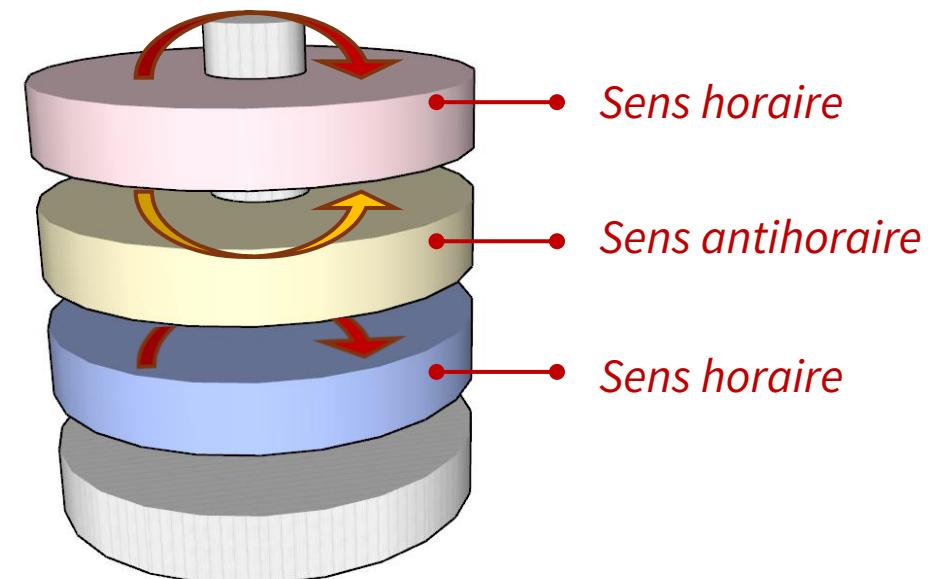


ELEMENTS DU SYSTÈME DE ROTATION



Double étage = étage habitable + étage productif

Système S {Volume central (fixe) ; Double étage 1 (rotatif) ; Double étage 2 (rotatif) ; Double étage 3 (rotatif) ; Liaisons pivotaires alternées}

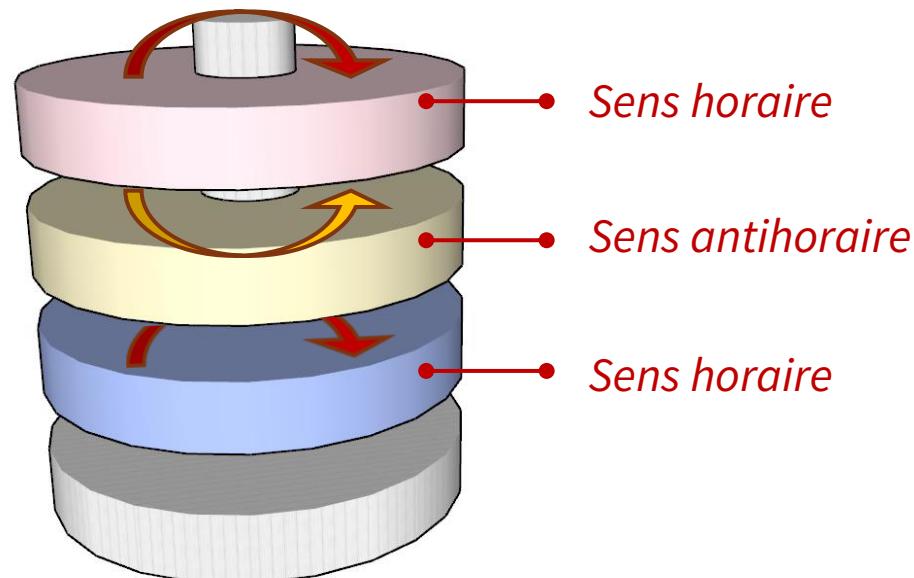


SYSTÈME FONCTIONNEL

ELEMENTS DU SYSTÈME DE ROTATION

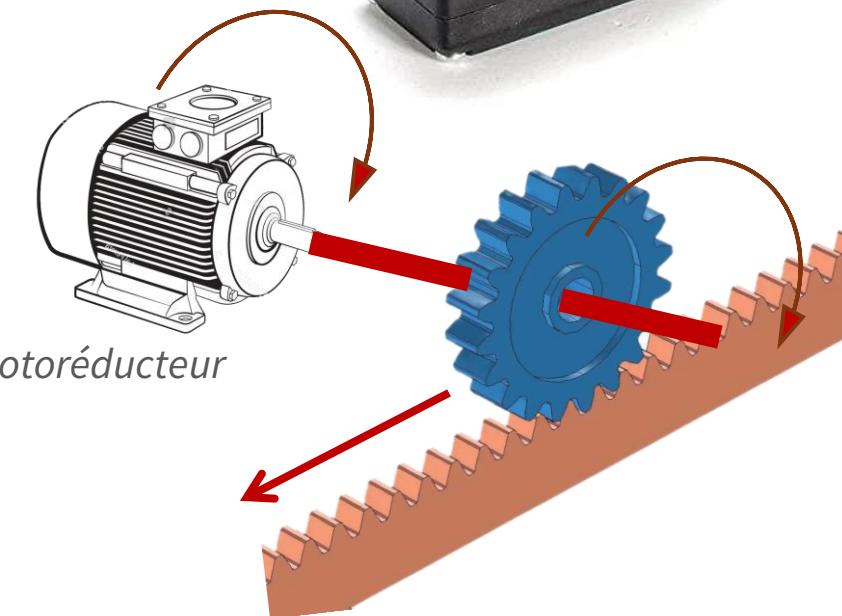
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Moteur rotatif:

Servo motor



03

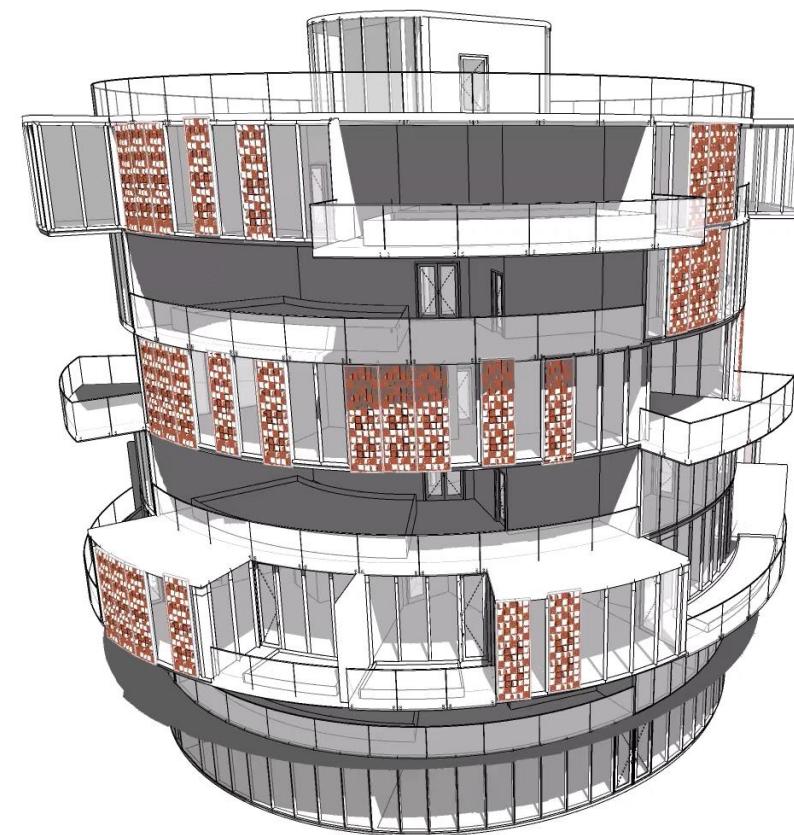
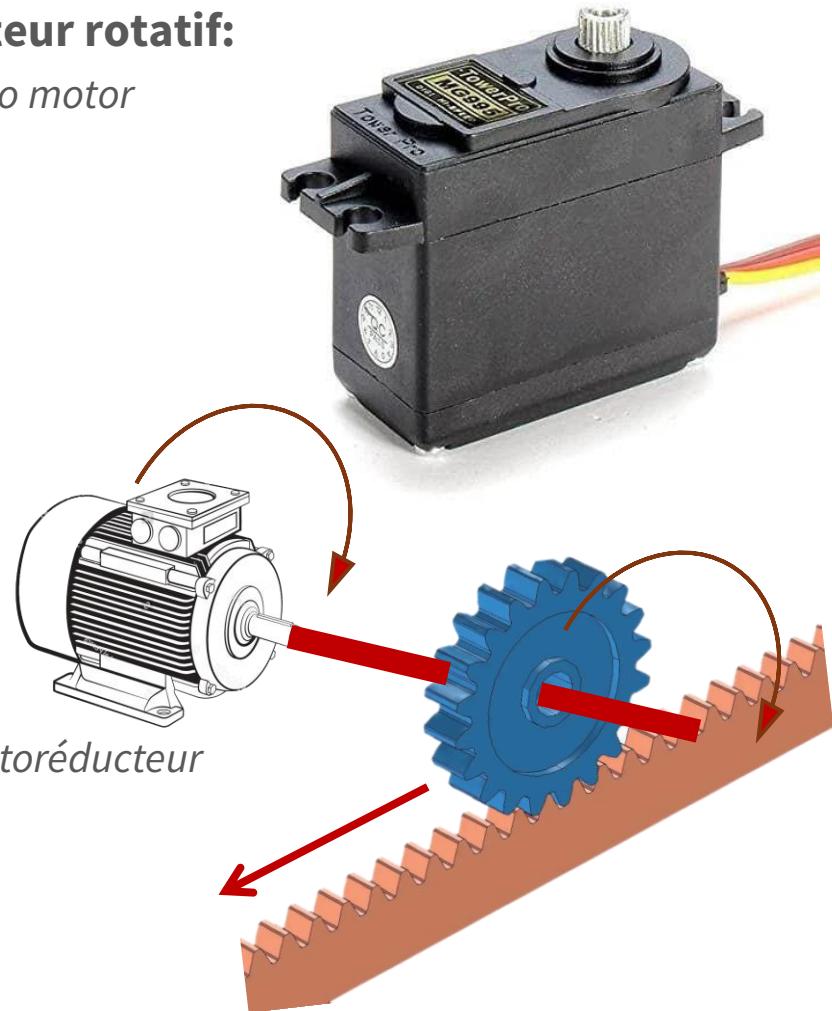
THE SUNTOWER BUILDING



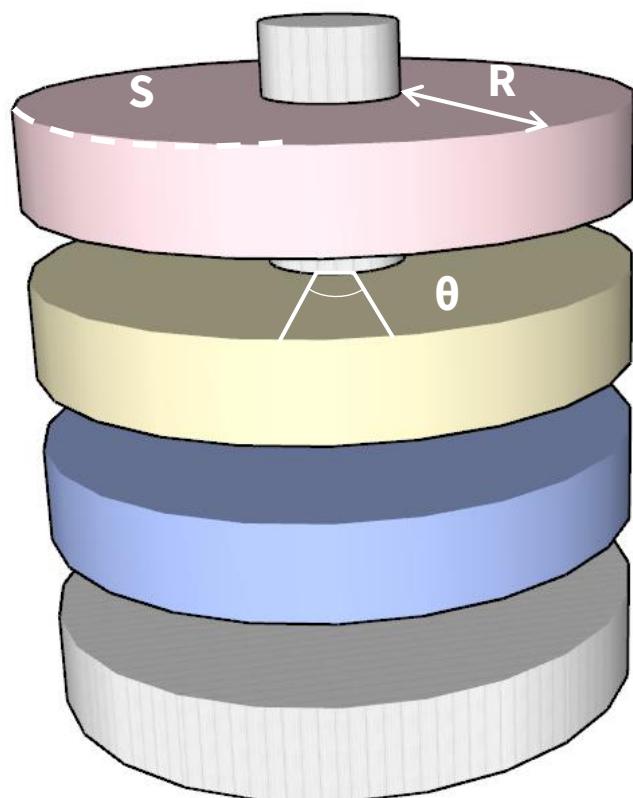
ELEMENTS DU SYSTÈME DE ROTATION

Moteur rotatif:

Servo motor



ELEMENTS DU SYSTÈME DE ROTATION



Formules de base :

$$S=R\theta$$

$$\omega=\theta/t$$

$$v=S/t$$

Rayon du bâtiment

15 m

Rotation en 12h

$90^\circ = \pi/2$ radians

Vitesse angulaire

$3,63 \times 10^{-5}$ rad/s

Distance parcourue en 12h

23,56 m

Vitesse linéaire périphérique

$0,0545 \text{ cm/s} = \mathbf{0,545 \text{ mm/s}}$

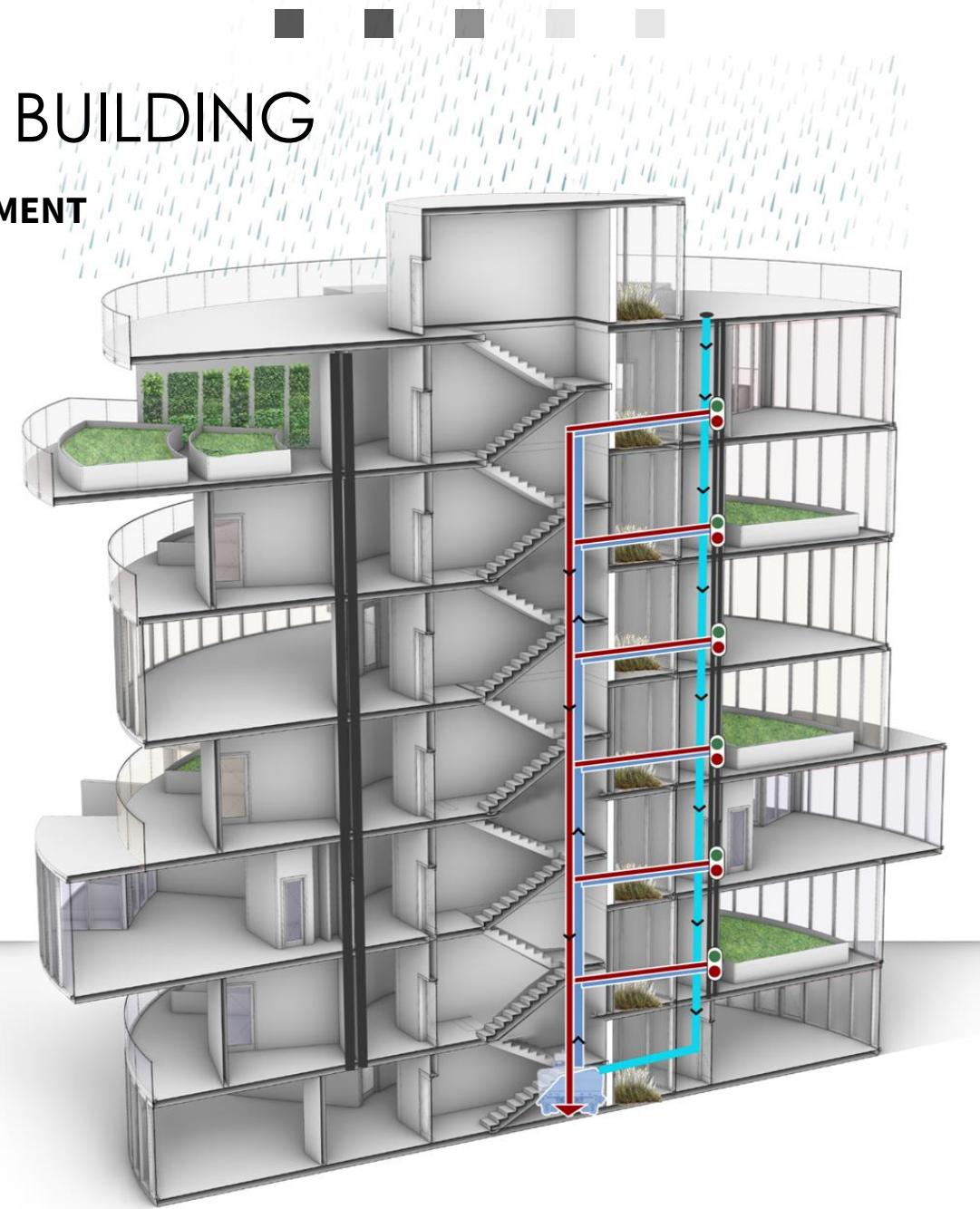
03

THE SUNTOWER BUILDING

RESEAU HYDRAULIQUE & ASSAINISSEMENT

LEGENDE

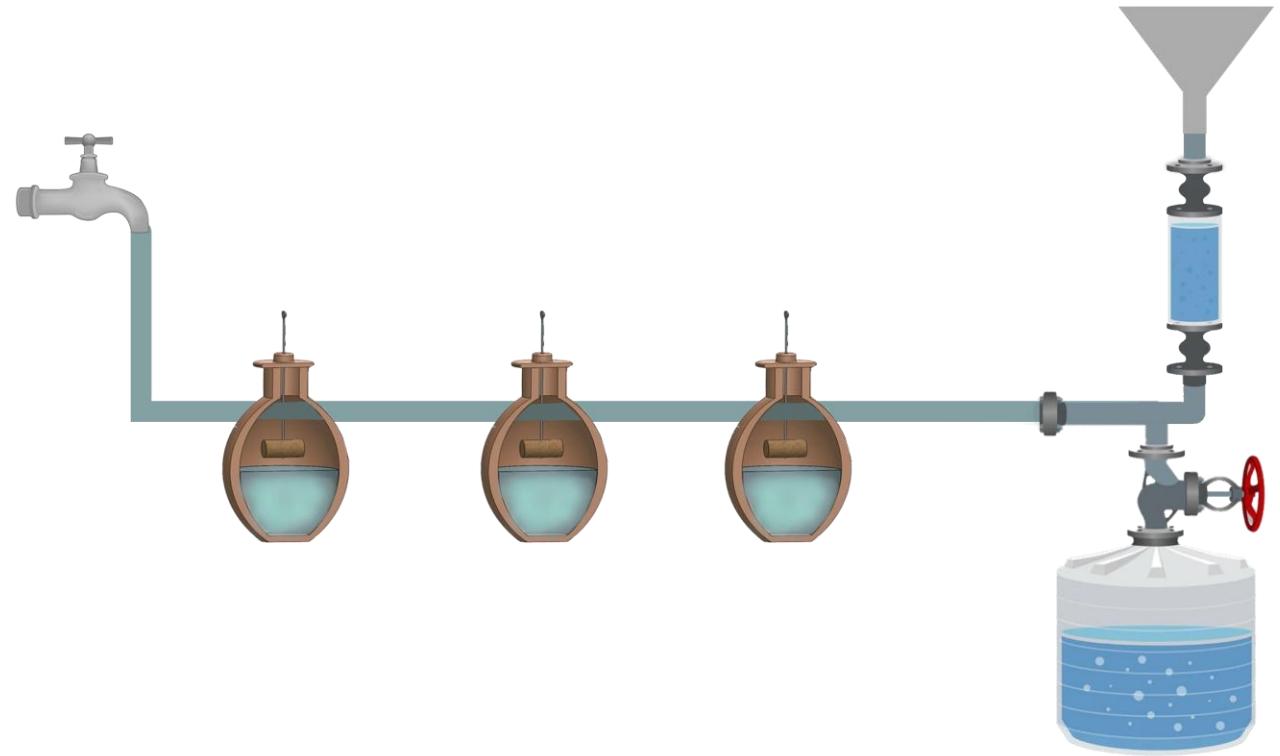
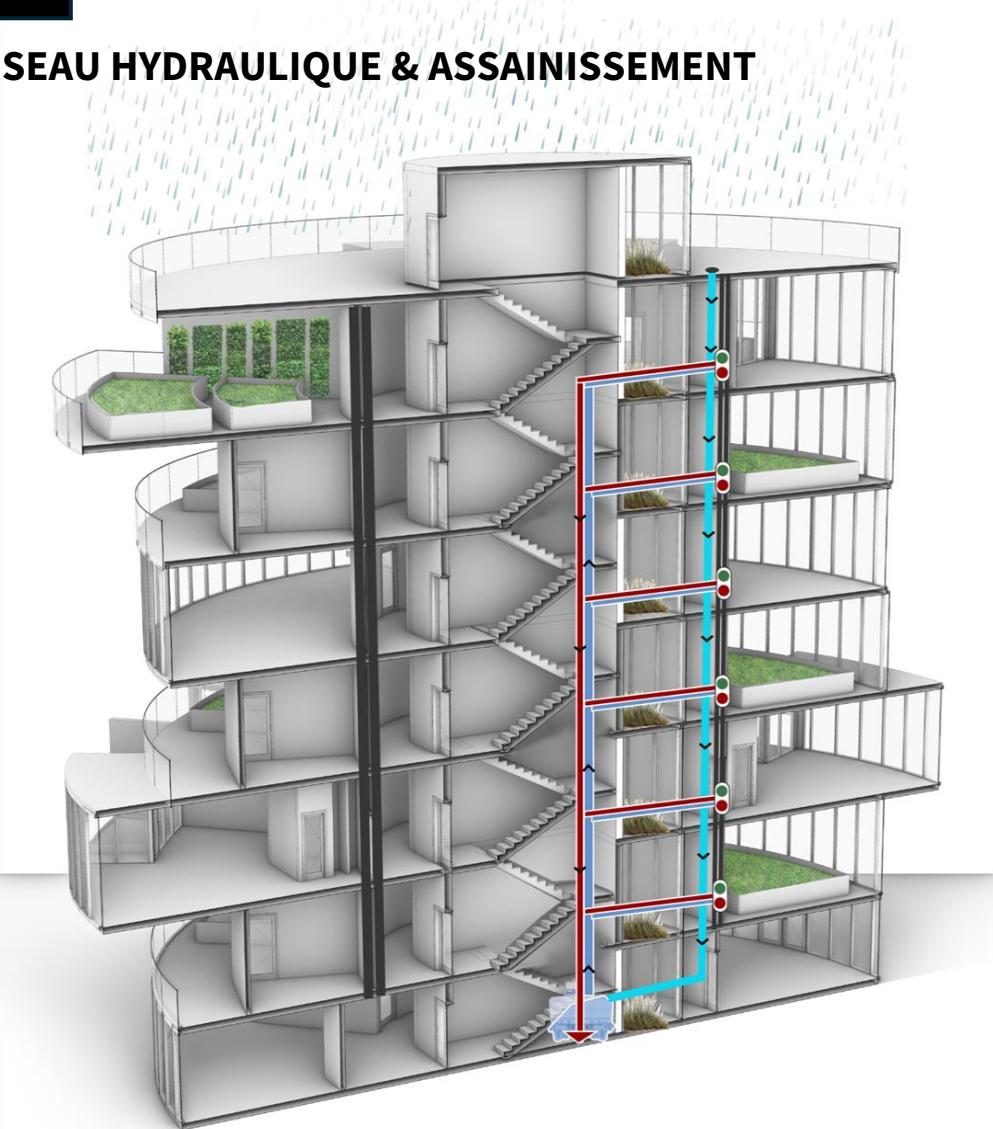
- Eaux pluviales
- Eau potable
- Eaux usées
- Réservoir de récupération
- Commande automatique des flux
- Sens d'écoulement



03

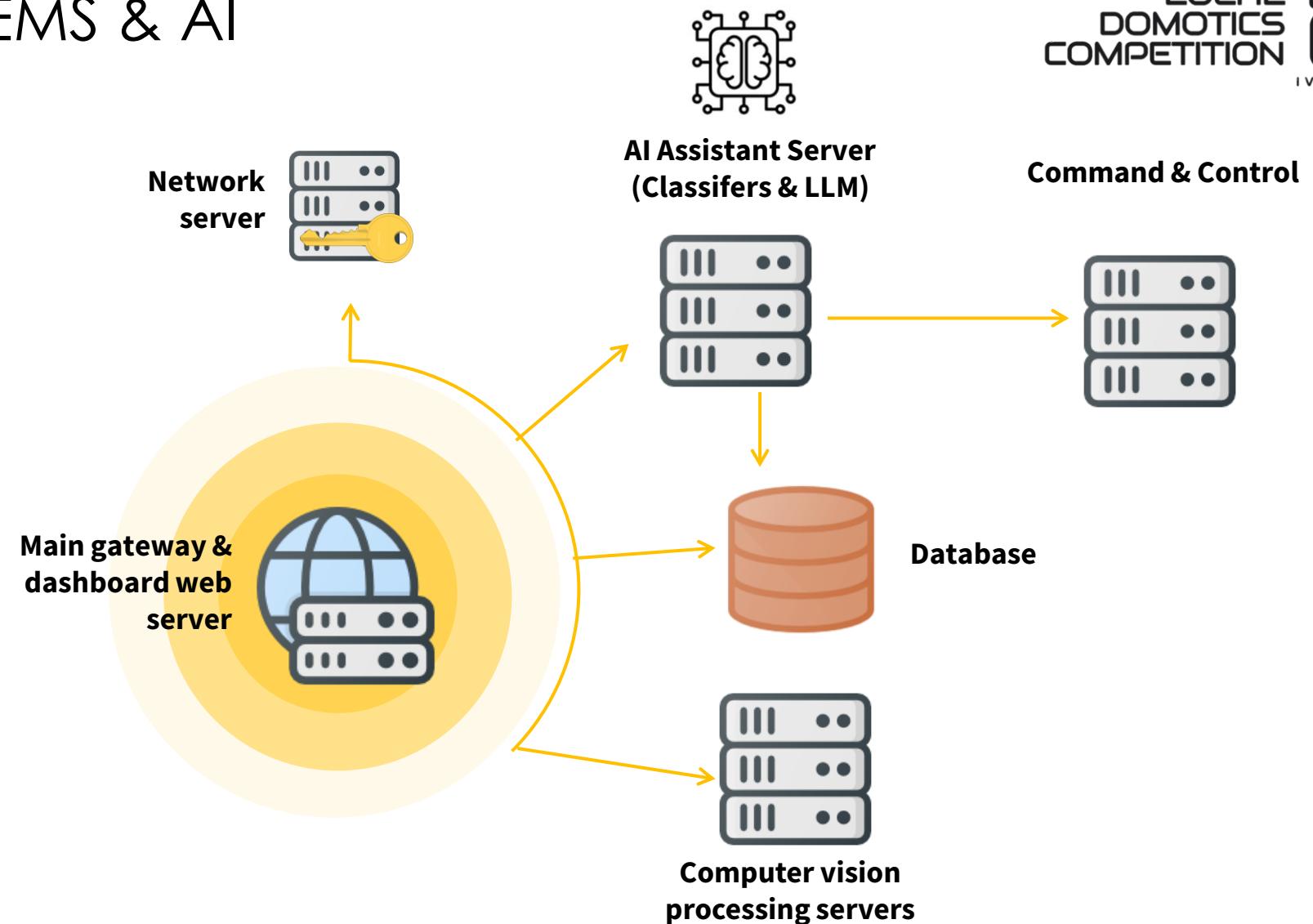
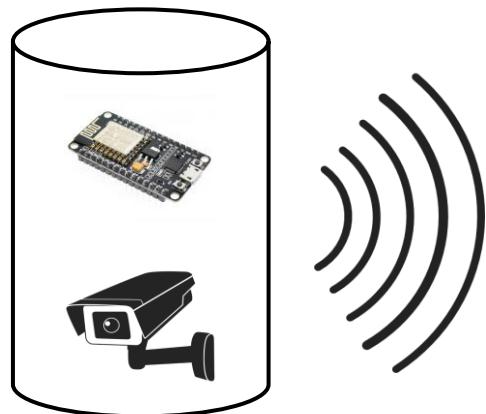
THE SUNTOWER BUILDING

RESEAU HYDRAULIQUE & ASSAINISSEMENT





System architecture





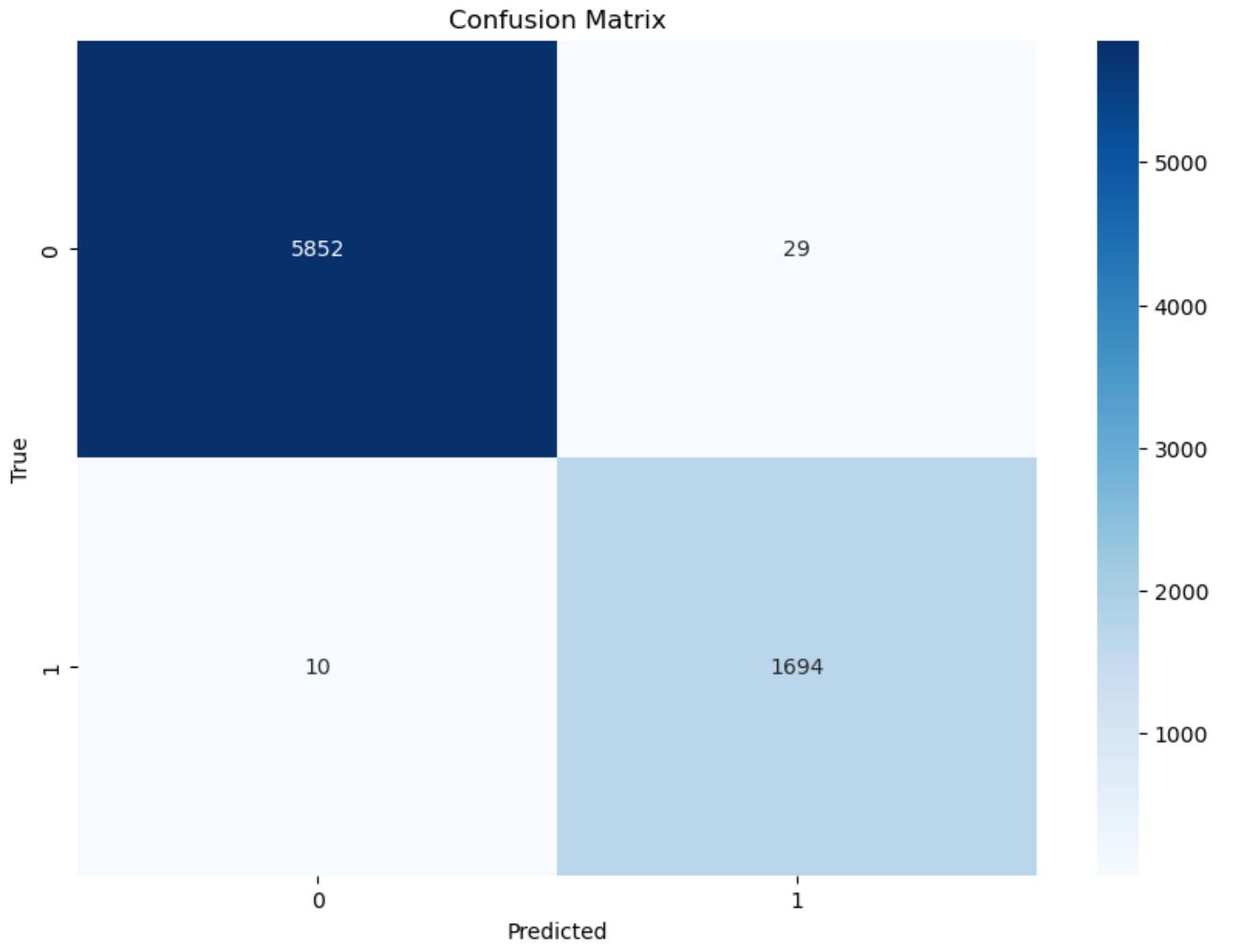
Smart Irrigation Decision Model

Evaluation:

- **F1 Score:** 0.989
- **Precision:** 0.983
- **Recall:** 0.994 ⚠ Important metric ⚠

Highly reliable, errs on the side of watering to avoid plant stress.

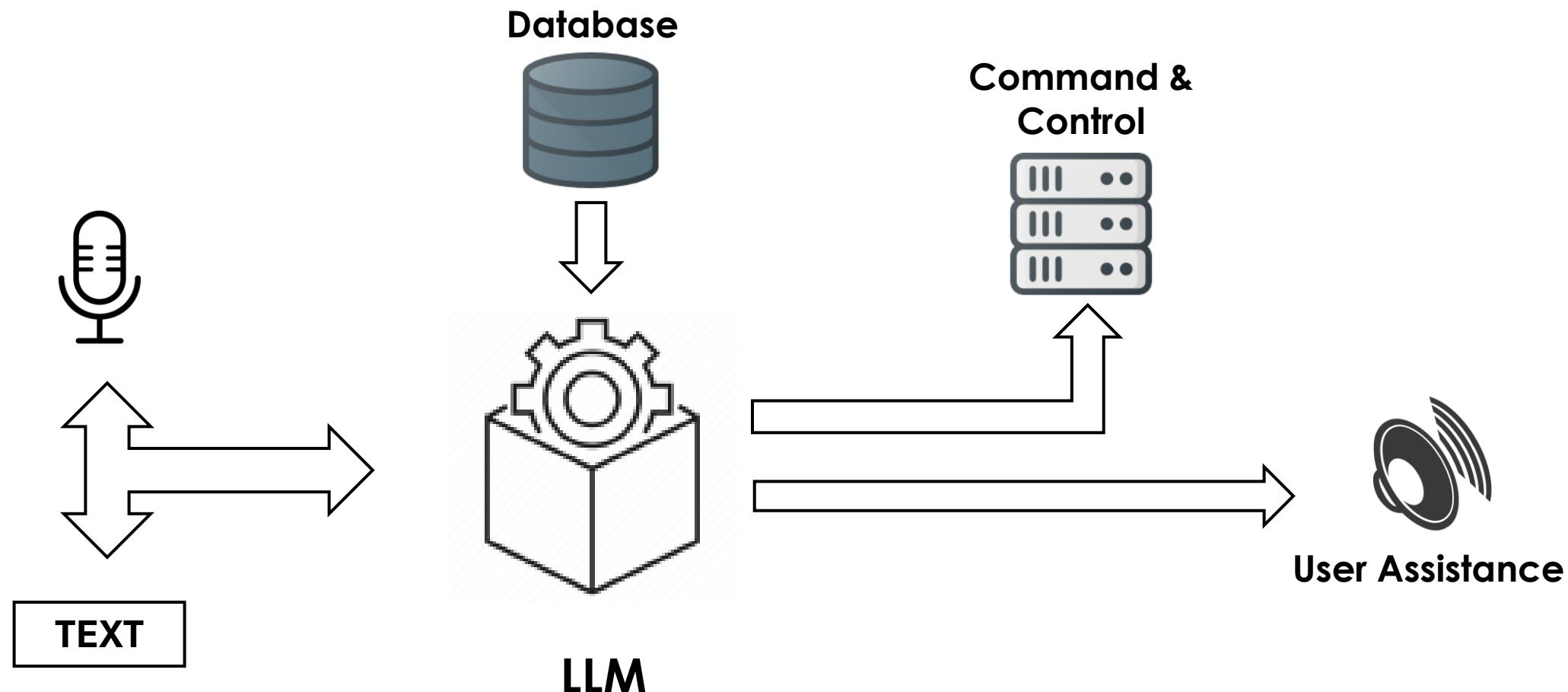
Recall penalises false negatives



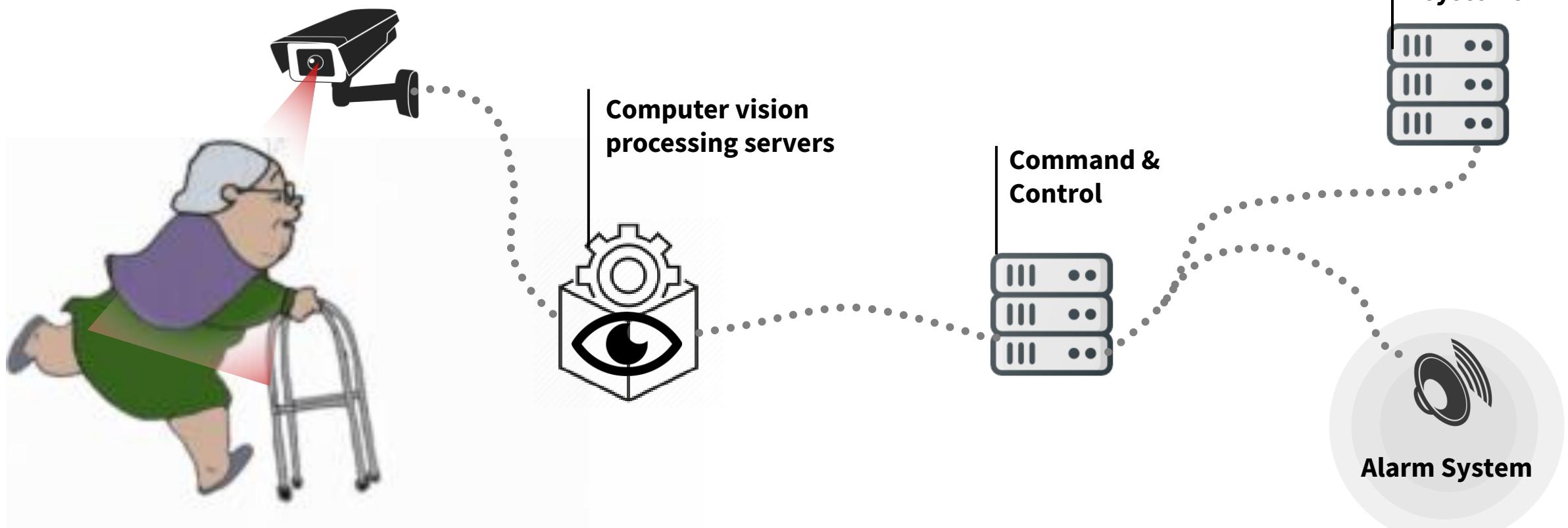


LARGE LANGUAGE MODEL

Command and Assistance



Computer Vision Unit



EMBEDDED SYSTEMS & AI Dashboard



Live KPIs – latest temperature, humidity, light intensity, and water levels

Chat / Voice Interface – “Talk to System” lets users use the AI Assistant

ML Prediction – Checks whether the plants needs watering or not

Manual Commands – buttons to toggle system functionalities

ID	Gas	Fire	Irrigating	Water Lv.	Light	Humidity	Temp.
3	✗	✗	✗	48.84	512.0	45.5	22.0
2	✓	✗	✗	1.0	1.0	1.0	1.0
1	✗	✗	✗	1.0	1.0	1.0	1.0

05

THE SUNTOWER BUILDING

AMBIANCE EXTERIEURE



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AMBIANCE EXTERIEURE

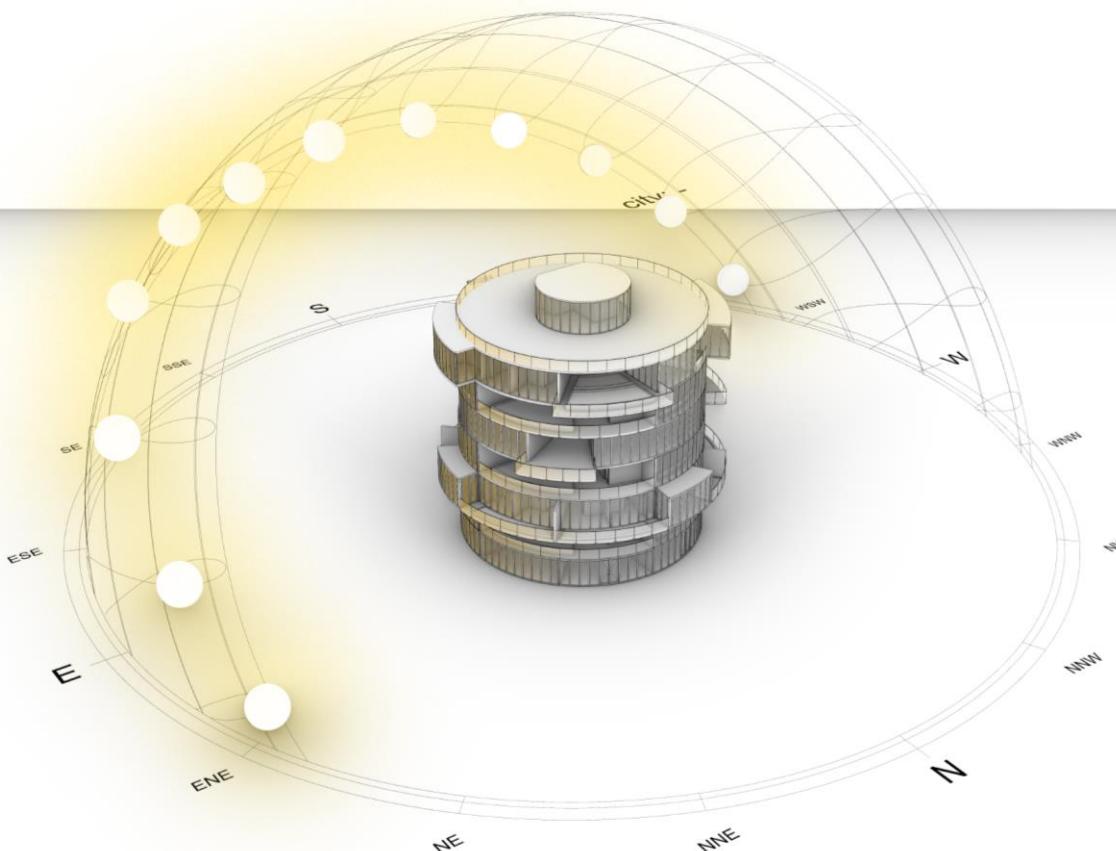


SUNTOWER PROJECT

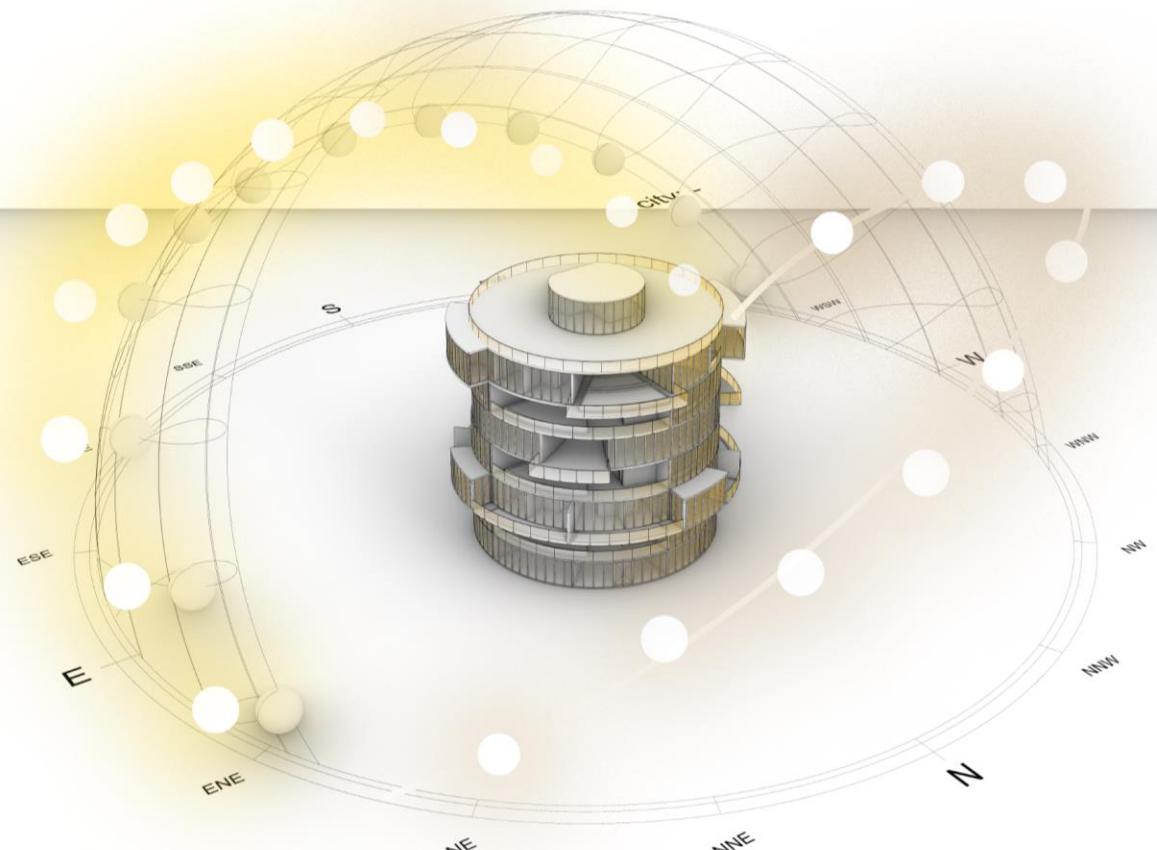
05

THE SUNTOWER BUILDING

TRAJECTOIRE DU SOLEIL



Sans système rotatif



Avec système rotatif

05

THE SINTOWER BUILDING

AMBIANCE EXTERIEURE

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