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INSTITUT POUR LA TRANSITION ENERGETIQUE

QUANTITATIVE ENVIRONMENTAL ASSESSMENT OF DEVELOPMENT OPERATIONS FROM THE EARLY STAGES OF THE PROJECT IN STRASBOURG METROPOLIS (FRANCE)

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ADEME



Agence de l'Environnement
et de la Maîtrise de l'Energie

12/07/2019

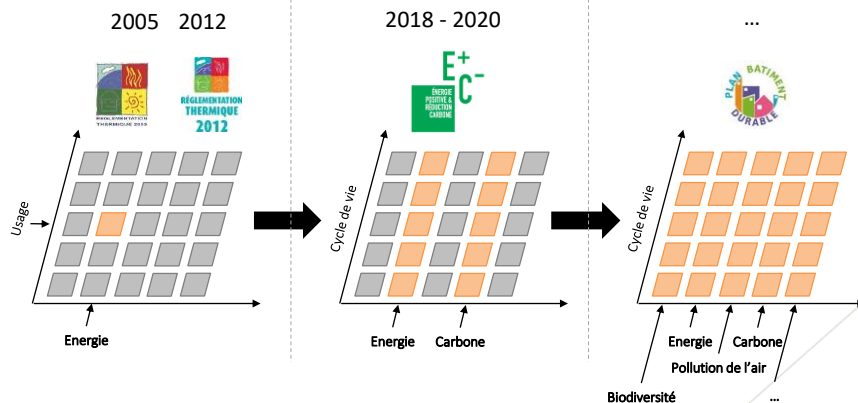


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CONTEXT

Evolution of practices for assessing the environmental impacts of the construction sector



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▶ NEST

QUANTITATIVE EVALUATION TOOL FOR THE SUSTAINABILITY OF DEVELOPMENT OPERATIONS

- Environmental indicators based on life cycle analysis methodology
- "Quality of life" indicator
- Economic indicator

AIMS

- Evaluate, on the basis of a 3D model, the impacts of a development operation
- Give decision-makers and designers key elements to integrate sustainable development into their projects right from the programming phase
- Master the impacts of development operations

INITIAL TARGET

- NEST © IS INTENDED FOR THE MASTERS OF WORKS (URBAN PLANNERS AND BE) AS WELL AS THE MASTERS OF WORKS OF OPERATIONS OF INSTALLATIONS AND ECO-NEIGHBORHOODS

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▶ PLUG-IN SKETCHUP

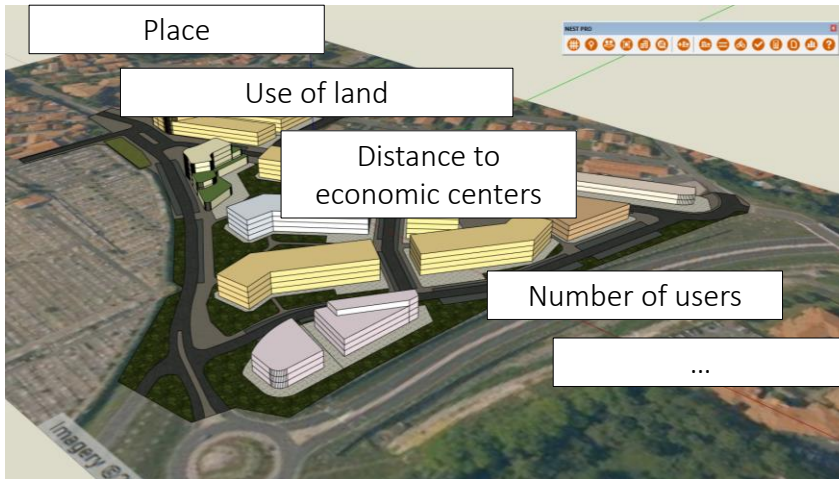


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STEP (1)

General data



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STEP(5)

Population Distribution and Transport Scenarios

Paramètres Transport

1-Population
Répartition population (Act:44%, Mat:4%, Pri: 4%, Col: 4%, Lyc: 4%, Etu: 6%, Ret: 34 %)
Répartition actifs (30%, 30%, 10%, 30%)
Répartition non-résidents (Bur:50%, Com:50%)

2-Mobilité de la population
Actifs résidents (50 30 0 0 15 5)
Enfants de Maternelle (50 30 0 0 15 5)
Enfants du Primaire (50 30 0 0 15 5)
Collégiens (50 30 0 0 15 5)
Lycéens (50 30 0 0 15 5)
Étudiants (50 30 0 0 15 5)
Retraités (50 30 0 0 15 5)

3-Mobilité des employés non-résidents
Employés de bureaux (50 30 0 0 15 5)
Employés de commerces (50 30 0 0 15 5)

4-Distances individuelles moyennes
Logement - école maternelle 0,14
Logement - école primaire 0,14
Logement - collège 0,14
Logement - lycée 0,14
Logement - université 0
Logement - commerces 2,50
Logement - bureaux 0,12
Logement - autres 0,17
Logement-arrêt de bus 2,50
Logement - parking vélo 2,50

Répartition population
Répartition de la population par catégories sociales

Ok

Répartition de la population

1-Population
Répartition population (Act:44%, Mat:4%, Pri: 4%, Col: 4%, Lyc: 4%, Etu: 6%, Ret: 34 %)

Répartition de la population

Catégorie	Actifs	Enfants de Maternelle	Enfants du Primaire	Collégiens	Lycéens	Étudiants	Retraités
Pourcentage	44	4	4	4	4	6	34
Nombre	880,0	80,0	80,0	80,0	80,0	120,0	680,0

Reset Ok

Scénario des transport

2-Mobilité de la population
Actifs résidents (50 30 0 0 15 5)

Répartition du transport

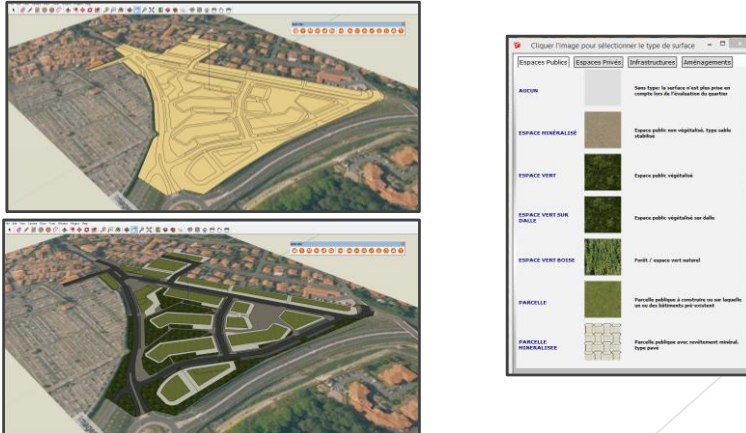
Catégorie	Voiture	Bus	Tram	Train	Vélo	A pieds
Enfants de Maternelle	50	30	0	0	15	5
Enfants du Primaire	50	30	0	0	15	5
Collégiens	50	30	0	0	15	5
Lycéens	50	30	0	0	15	5
Étudiants	50	30	0	0	15	5
Retraités	50	30	0	0	15	5

Ok

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STEP(2)

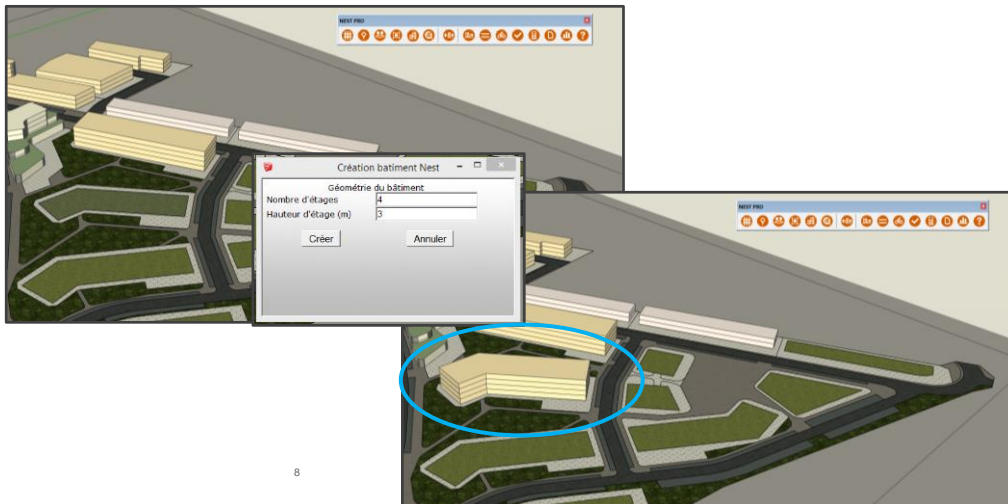
Drawing and characterization of roads and surface types



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STEP (3)

Drawing of buildings



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STEP (4)

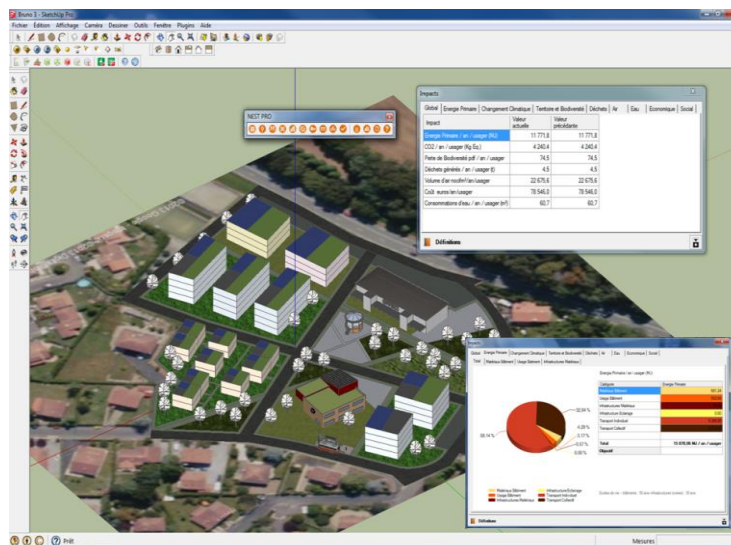
Characterization of buildings

The screenshot displays the 'Caractérisation composant' window with two tabs: 'Généralités' and 'Energie'. The 'Généralités' tab shows parameters for building description, including name, category, and construction system. The 'Energie' tab shows parameters for energy performance, including heating system, ventilation, and solar panels. A 3D model of a building complex is shown in the background, with a blue box highlighting a specific building. Labels point to various components: 'Typologie' (Building Type), 'Système constructif' (Construction System), 'Performance énergétique' (Energy Performance), 'PV / Solaire thermique' (PV / Thermal Solar), 'Chauffage' (Heating), 'Ventilation' (Ventilation), and 'ECS' (Domestic Hot Water).

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NEST, AN QUANTITATIVE ENVIRONMENTAL ASSESSMENT SOFTWARE



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INDICATORS

Indicators used in NEST

Indicateur	Catégorie	Type
Energy	Environnement	LCA (impact Indicator)
CO2	Environnement	LCA (impact Indicator)
Land Use	Environnement	LCA (impact Indicator)
Waste	Environnement	LCA (flow Indicator)
Air quality	Environnement	LCA (impact Indicator)
Water consumption (directe)	Environnement	LCA (flow Indicator)
Cost of the project	Economie	Acquisition + energy
Satisfaction of users	Social	Created by NOBATEK

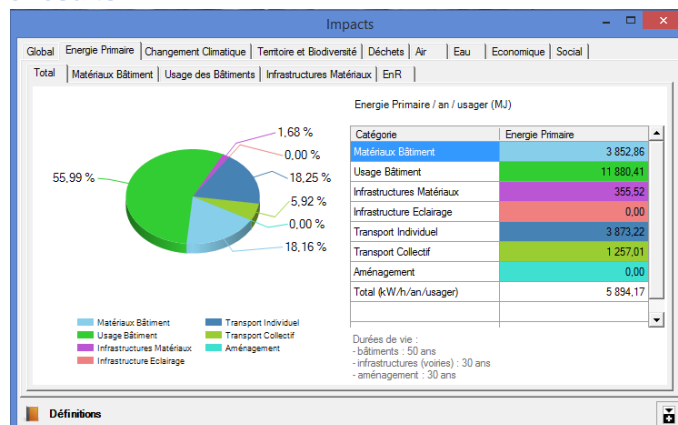
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STEP (6)

Visualization of the results



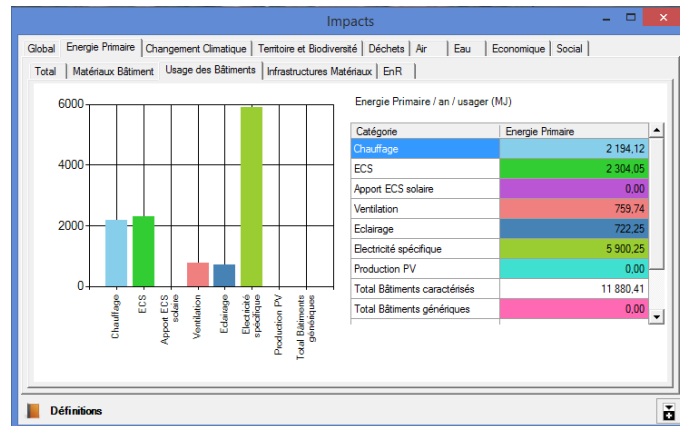
Primary energy consumption (MJ/an/users)

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STEP (7)

Visualisation de résultats



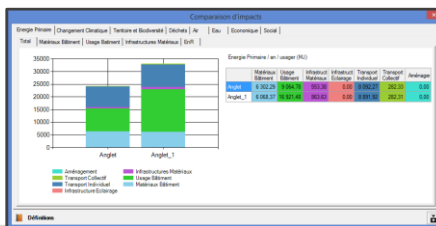
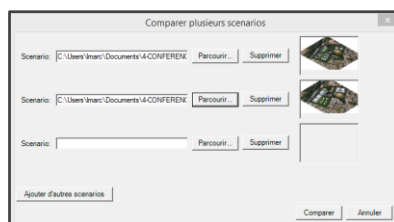
Primary energy consumption related to the use of buildings

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STEP (8)

Comparaison de scénarios



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AN LCA THAT CAN BE UNPRODUCTIV

- This tool had significant limitations.
- The environmental indicators were not adapted to the management scale.
- It was impossible to use the tool on a large scale for heavy file issues.
- The proposed result was not meaningful for decision makers.

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NEW POSTION

- PEDAGOGIC / SENSITIZATION tool "macro" scale.
- It was decided not to evaluate non-quantifiable indicators (such as biodiversity). Results from a computational approach tend to let non-specialists think that they are accurate.
- Diversified themes including energy, environment, transport, quality of life, biodiversity, up to an indicator of "happiness" (functional mixity).

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IDENTIFICATION OF EXISTING METHODOLOGIES AND TOOLS + MAIN ENVIRONMENTAL, SOCIAL AND ECONOMIC ISSUES FOR EMS

25 indicators from the EMS documents



+ 60 indicators from other standards (ISO 37120, AUE2, etc.)

Indicators
Total primary energy
Climate change
Modal shares of employed assets
Urban sprawl / Soil artificialisation
Quality of the service of the territory
Functional mixity
Median income per consumption unit
Rent cost for social housing

Example of data taken into account for the functional mix:
The presence of medical practices, The presence of schools The presence of shops, The level of energy efficiency of buildings, The presence of green spaces, The density of population: The presence of cycle tracks The quality of the public transport service.

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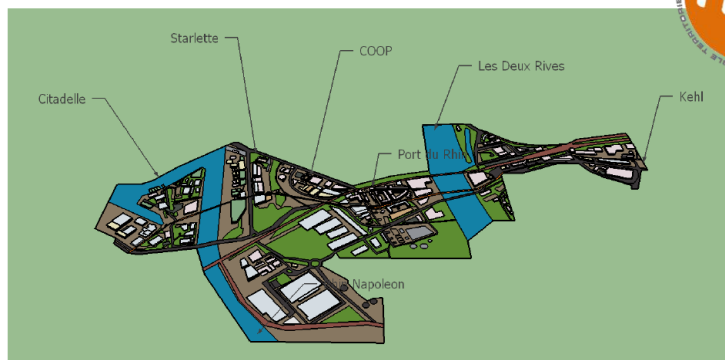
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OPERATIONS STUDY WITH NEST

Modélisation of the ZAC des Deux Rives with NEST (plugin Sketchup)



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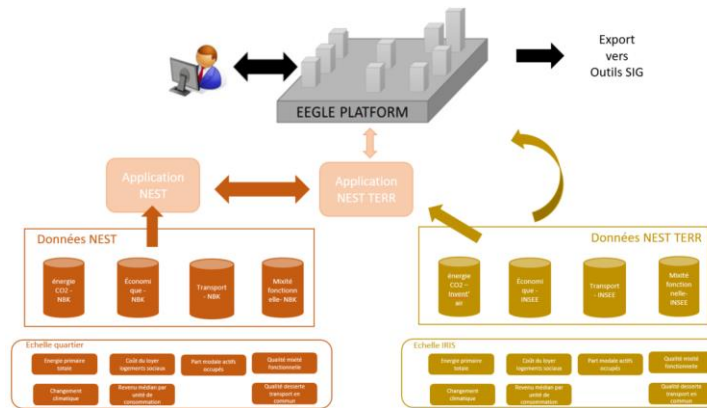
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INCORPORATION OF RESULTS IN EEGLE

The SaaS platform developed by EEGLE show territorial digital data management in a visual environment.



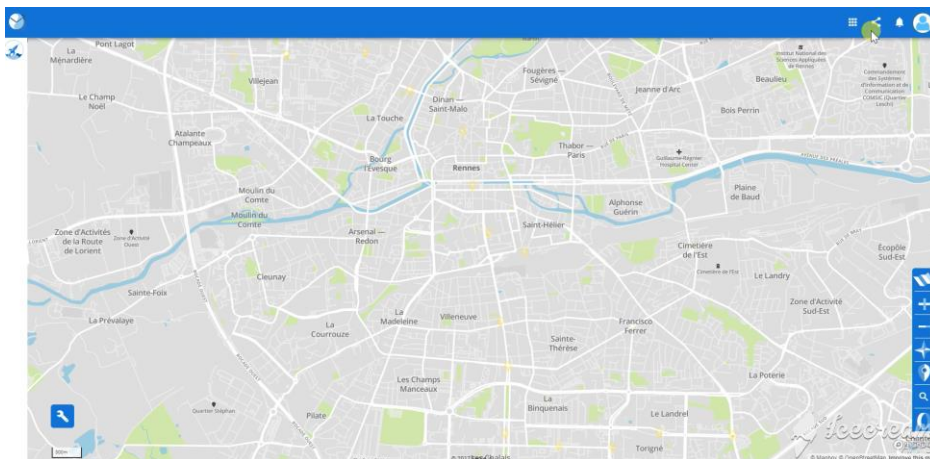
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INCORPORATION OF RESULTS IN EEGLE



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CASE STUDY : ZAC DES DEUX RIVES

The operational area of the ZAC covers 74 hectares and covers non-contiguous sites:

- ❖ Citadelle
- ❖ Starlette
- ❖ Coop
- ❖ Port du Rhin
- ❖ Rives du Rhin

Issues of the ZAC

- ❖ Respond to a symbolic issue by creating an "urban" place correlated with Germany.
- ❖ Put mobility at the heart of urban design by relying on the tram as an axis of development and opening up of territories.



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EXAMPLE OF USING THE TOOL NEST TERR

Results interpretation - Total primary energy

Operation scale

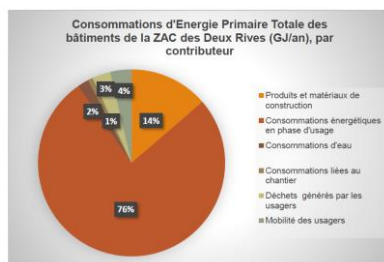
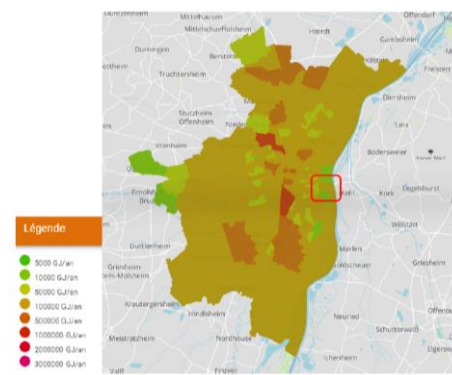
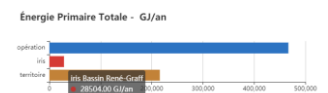


Figure from a post processing results in Exce

Territory scale



Comparaison



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EXAMPLE OF USING THE TOOL NEST TERR

Results interpretation– Climate change

Operation scale

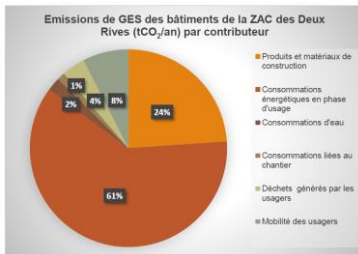
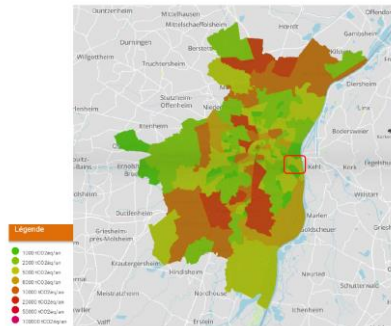


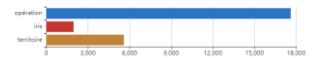
Figure from a post processing results in Exce

Territory scale



Comparaison

Changement Climatique - tCO₂eq/an



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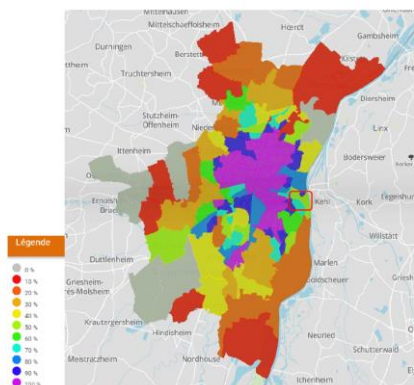
EXEMPLE D'UTILISATION DE L'OUTIL NEST TERR

Results interpretation– Etalement urbain/Artificialisation des sols

Operation scale

- ☐ 87,5% artificialised
- ☐ 12,5% not artificialized

Territory scale



Comparaison

Part modale des actifs occupés - %



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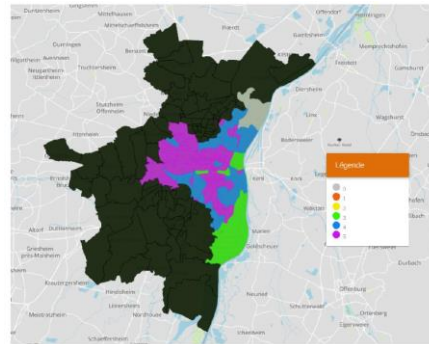
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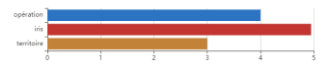
EXEMPLE D'UTILISATION DE L'OUTIL NEST TERR

Results interpretation– Mixité fonctionnelle

Score 4 : Satisfactory functional mix



Mixité fonctionnelle - Score compris entre 0 et 5



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LIMITES ET DIFFICULTÉS RENCONTRÉES

- ❖ Territorial data management
 - ☐ Diversity of data formats.
- ❖ Interoperability with 3D models
 - ☐ Diversity of computer formats
- ❖ Calculation methods
 - ☐ Environmental assessment: availability of data at equivalent perimeter

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NEXT STEPS

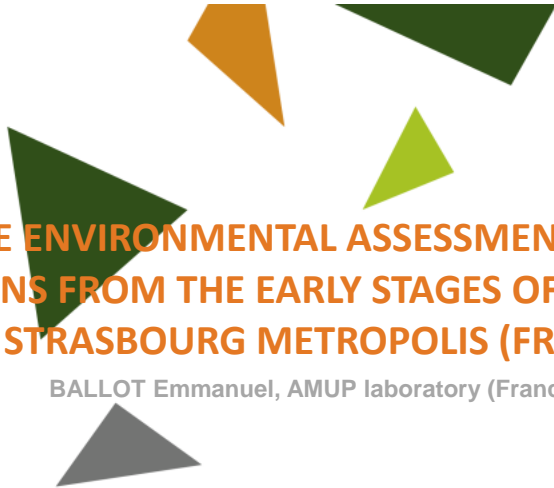
- ❖ Objective 1: confirm the relevant sustainability indicators at different scales of the study
- ❖ Objective 2: develop the associated methodology to monitor the indicators
- ❖ Objective 3: apply all the elements developed in the project to other development operations to enable Eurometropolis of Strasbourg to have quantitative and objective elements for the definition of its management strategy

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THANK YOU !



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