User's Guide of STRATEAU

Strategic analysis tool and prospective for the balance demand/water resources

Summary

Introduction

The strategic and prospective analysis tool of the balance between demand and available water resources

What is this?

The main methodological principles
- The Homogeneity
- The Additives
- The Allocation Rules

Usage limits and precautions
- Which data for which sort of usage
- Threshold Representation
- Results according to "Resources"

How to use the tool?
- Access (to be defined **subsequently** by the regional partners)
- Available outputs
- Downloadable Excel File
- Via SQL applications

Using the website

Introduction

Since 2009, energies Demain provides the strategic analysis tool and prospective for the balance demand/water resources (STRATEAU) to be deployed in the countries of the Mediterranean.

The goal of this tool is to provide to the regional actors a decision support for public policies in water management. It is therefore a tool for decision support designed to improve the choice of political strategy related to Water Demand management (WDM) or to the impacts of the water supply.

STRATEAU is developed to quantify the demand and the water resources of a territory. Thus, the users of the tool will:

- Define the location of the pressure on water resources. The tool allows identifying during which period of the year and in which location of the territory the imbalance supply/demand takes place.

- Get a decision support. The tool provides a detailed use of the resources in order to clarify the different usage of water. Territorial strategies for water management could appear from the clarification of pattern use. The implementation of scenarios allows the modeling of a development policy on the balance between water supply and demand.

- Develop strategies to anticipate. It will be possible to study the impact of the future weather trends through the implementation of scenarios. This will include action plans in order to avoid conflicts.

However it is important to understand that STRATEAU does not constitute an automatic scenario since the prospective scenario will be generated by using data entered by the user.

On the other hand, STRATEAU does not allow the calculation of virtual water. It provides information required for its calculation but it does not incorporate in the reconstitution of virtual water as in the food chains.

Finally, it is not a tool for hydrological components of groundwater and rivers but it is a strategic and analysis tool for the water balance supply / demand across a territory scale.

Strategic analysis tool and prospective for the balance demand/water resources

What is this?

STRATEAU is a strategic analysis tool for the balance demand/water resources across a territory. It is a "calculation box" for regional and local actors who used to have an inventory of water demand of their territories. Water demands are taken into account the following sectors:

- agriculture
- Energy
- Residential
- Tertiary
- Industry
- Environment (forest, moors,…)

For each sector, the results (sampling and water consumption) are generated according to a data base - the determinants of activities - which describe the demographical characteristics, economical, social, etc of the territory. These determinants allow analyzing in detail the sources of sampling and consumption taking into account the details of the territory, the structure of the current economy, the population and the territory.

The main methodological principles

The tool has been designed to meet specific methodological principles. They are shown below in order to inform the user on the methodology and to understand better the results proposed by the tool. A more detailed methodology document is available.

The Homogeneity

The model was created in a way to obtain the indicators concerning water demand no matter what is the level of user's information. Thus, STRATEAU is directed more to achieve final given data (local level) than the aggregated data at national scale. France, as an example where these data are available, the needs and consumptions are estimated according to the given activities (population census, agricultural statistics, employment, etc.) being available as a whole in all countries at the local level for the year 2006. This spatiotemporal homogeneity guarantees the unit and coherence of the results and allows the establishment of an updated, relatively simple procedure.

Everyone respects the homogeneity principle; the tool has been designed in a way that might put in evidence the local specificities:

- A systematically privileging type of approach "bottom up" of reconstitution of the water demand (according to the given data of activity), permitting the study of the
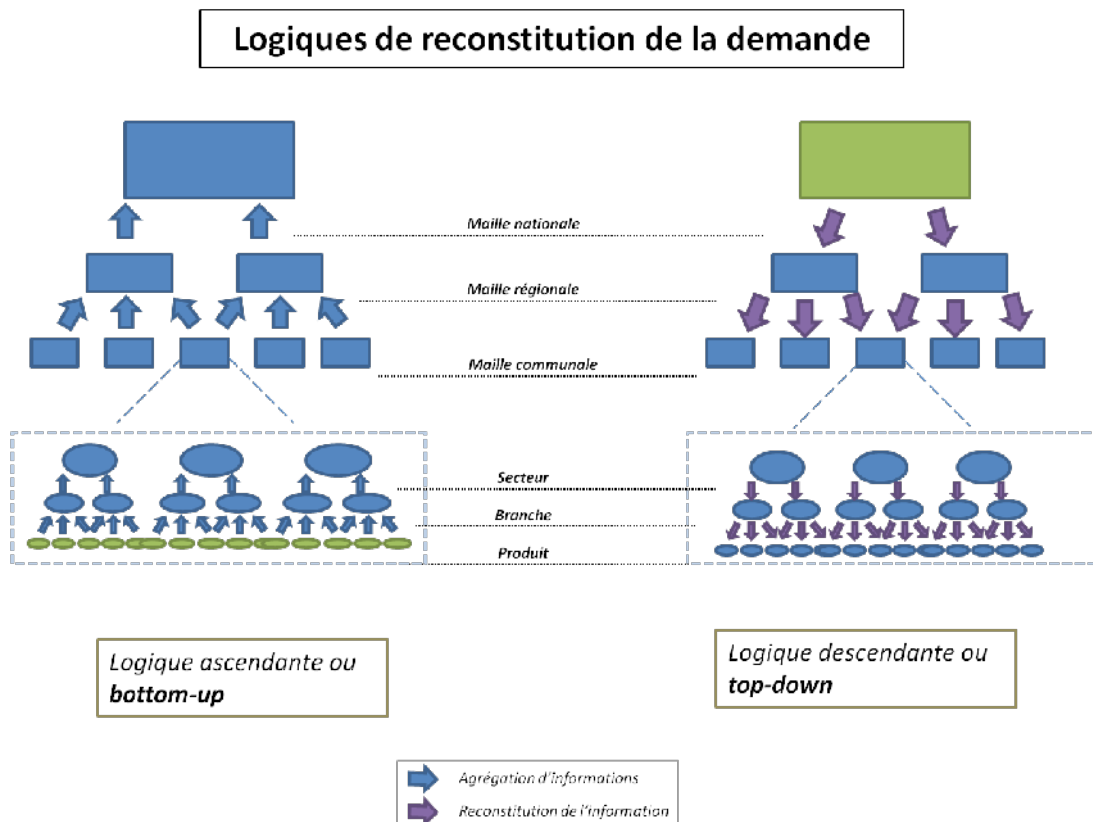
consumption mechanisms and to put the peculiarities of every territory according to regional and national means;

- Keeping the possibility where the administrator might substitutes partially the data for more local sources especially for the hypothesis concerning the equipments rates for example.

The Additives

The additives permit the reconstitution of withdrawals and the global consumption of a territory aggregating the withdrawals and the consumption of all infraterritories (spatiotemporal homogeneity is primordial). Also, the structure of the common local scale permits the extraction of a statement to all the required territory scales.
This methodological choice shows a big interest in the frame of the regional water strategy and/or departmental. This will equally permit to develop the contribution in the territories in order to achieve the regional objectives.

Logiques de reconstitution de la demande

Maille nationale

Maille régionale

Maille communale

Secteur

Branche

Produit

Logique ascendante ou **bottom-up**

Logique descendante ou **top-down**

Agrégation d'informations

Reconstitution de l'information

Demand reconstitution logics

National level
Regional level
Local level
Sector
Branch
Product
Ascending logic or bottom-up
Descending logic or top-down
Information aggregation
Information reconstitution

The Allocation Rules

The allocation rules are the most important parameters in order to calculate demands / territory water resources. In fact, such rules permit to make a link between the demand and resources (which demand will have impact on which resource? the same goes for dismissing) thus re-transcribing the considered territory.

This also permits to shed the light on the water stress territories where the demand of water is ensured by the neighboring territories. This might be important information for the local and/or regional managers.

Figure 1: global summary of methodological scheme in a simple illustration for the existing relations between demands and water resources.
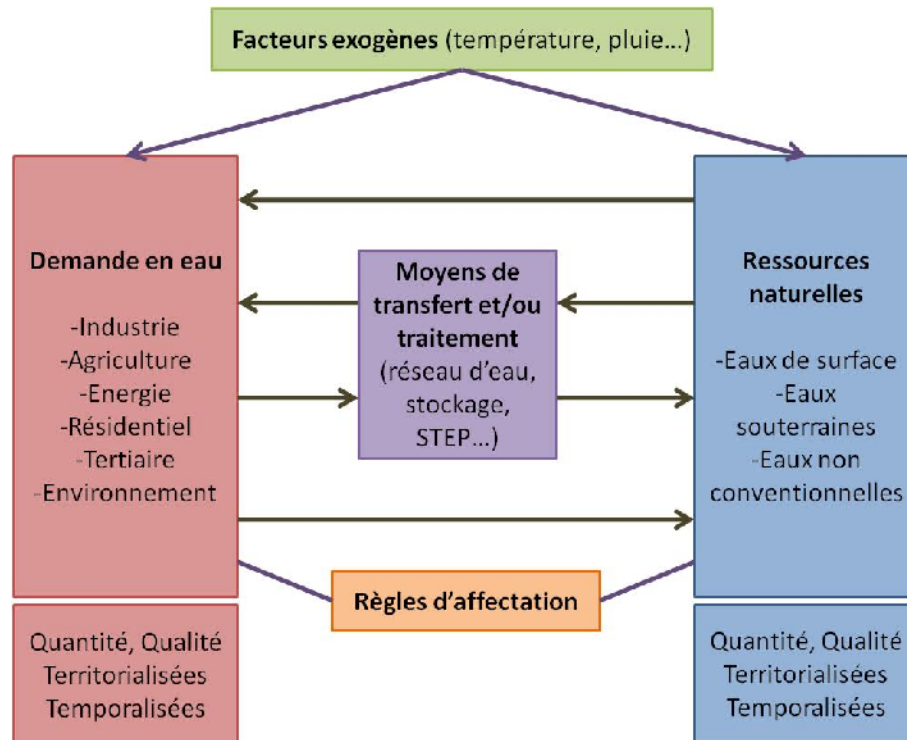
Figure 1: global methodological scheme

Exogenous factors (temperature, rain…)
Water demand
- Industry
- Agriculture
- Energy
- Residential
- Tertiary
- Environment

Transfer tools and /or treatment
(water networks, storages, STEP…)
Natural resources
Surface water
Groundwater
Non conventional water

Quantity, quality Territorialized
Temporal

Allocation rules

Usage limits and precautions

This tool has been designed to elaborate a strategy for water management demand locally and globally. The results are the suitable data modeling which refer to certain precautions.

Which data for which sort of usage?

The good usage of data is an essential element to understand the STRATEAU results. Nevertheless, it is important to distinguish the different types of the modeling data and their respective usages. We distinguish the following:

- **The data modeling**: it deals with the calculated data based on statistical data. We can also regroup under this typology the industrial productions, tourists' number, the reconstituted flows of the rivers… they all aim to describe the best mechanisms for water demand and the territorial issues. These data permit to animate the debate, to stimulate the reflections and mostly to adjust the strategic decisions and putting in evidence the issues and priority targets. This based on the present data which makes it possible to define the long term strategic objectives of the territory. We are not searching here for the accuracy of the used data, but rather for a precise description of the mechanisms driving to water consumption.

- Data timing: these are the real quantitative data which are implemented in the model for timing thus being so close to reality.

- Prospective data: these are the data which the user would implement in order to see the diverse scenarios in the statement demand /water resource. Nevertheless, it would be better to pay attention for the model exits at a prospective evaluation: it is not enough to change a single parameter in order to describe a future situation, but it should be based on full knowledge of modified data.

It is essential to distinguish these different typologies data and to limit the usage of each one according to their relevant areas. The precision and accuracy requirements vary for each of these data types.
The data provided by the tool are the data modeling where uncertainty may sometimes increase, but offering a clear vision of the emission mechanisms.

Threshold Representation

Thus, like all the modeling exercise, the data base may present uncertainty following the sectors. It is important to systematically maintain the sense upon using the provided data.

Results according to "Resources"

It is extremely difficult to deploy a methodology in order to describe the quantitative state of applicable water resources in all the rivers or in the slopes of the territory (a number of parameters is necessary, punctual and local studies are very efficient).

Nevertheless, the chosen method by Énergies Demain proposes a simple evaluation of the available water quantities and their variations. The obtained results are rather to be considered as inter-yearly or inter-monthly which are as the absolute valuable results. They permit to see if the resource is in equilibrium, in the exhaustion phase or in the recharging phase. It's very important to be aware of the limits of this model concerning "supply" part of water, and not to commit the mistake of taking the absolute values of the flows or of the water storage in the aquifers in order to describe the reality.

How to use the tool?

- **Access (to be defined subsequently by the regional partners)**

    The tool, a property of water embassy, will be available in territories and for national and local actors, according to the conditions which remain to be accurate.
    The data base is being taken for the moment at the service provider.
    Those who wish to use the data base must ask the administrator. As a result, they will receive a username and a password, which allowing them to access to one or several territories via internet according to their profile.
    Once the access is done, the group or territory can access to the concerned data of the territory via website:
    http://strateau.zen-conseil.com/
    The administration has confirmed during the test phase made by Ugo PIQUERAS and François VALADIER from energies-demain study office:
    ugo.piqueras@ energies-demain.com
    françois.valadier@ energies-demain.com
    The function and utilization of the site are detailed by the following.

- **The available outputs**

    The results of the tool are available in several ways and forms:
    The first and the very simple one, is presented as an Excel file downloadable from the website and illustrating the principal information regarding the selected territory.
    The second, necessitates programming knowledge, is done via applications of ORACLE data base.

- **Downloadable Excel File**

This format output xls is decomposed into several tabs:
- "**Summary**", presented as a table of contents reorienting the users towards the tabs they wish to access;

- "**Global statement**", synthesizing the main information of territory to be read as a summary.

- "**Withdrawals and deposits**", illustrated in a scheme and table form and schemes the route of the big water mass.

- "**Demands**", there is a tab by demand, each presenting at first time the selected entry determinants and then illustrating withdrawals and consumptions on monthly basis with high quality.

- "**Offers**", illustrating the pressures practiced on the different resources

- "**Offers/demands adequacy**", synthesizing under a graphic form the relations between the resources and the demands.

This output form, through the territorial study, generates synthesized data tables, usually accompanied by diagrams, facilitating the visualization and the rapid understanding.
Extremely rich and flexible, it permits the user to select the most pertinent data or to aggregate those which are at least in a territory or which he wishes to put in evidence.
In addition to this, the user can, according to the spreadsheet functions, choose the best mode of representation (histogram, camembert …) since the source data of every graph is available in a table form.
Finally, in order to provide the elements analysis, certain tables and graphs offer the possibility to compare the obtained results of the territory studied to those of the completed hydrographic basin.
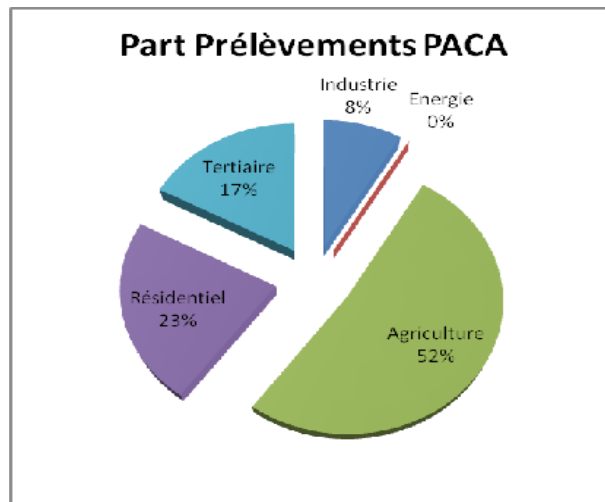
Figure 2: illustration of available outputs in Excel-Global (1)

Few available graphic examples and tables:
Withdrawals part PACA
Industry 8%
Energy 0%
Tertiary 17%
Residential 23%
Agriculture 52%

Global graphs on water demand in the studied territory (withdrawals, deposits, water consumptions) will be accessible in the tab "Global Statement" in the downloadable Excel file.
This type of graphic permits to have a complete vision of water needs of the territory by sector known by water actors.
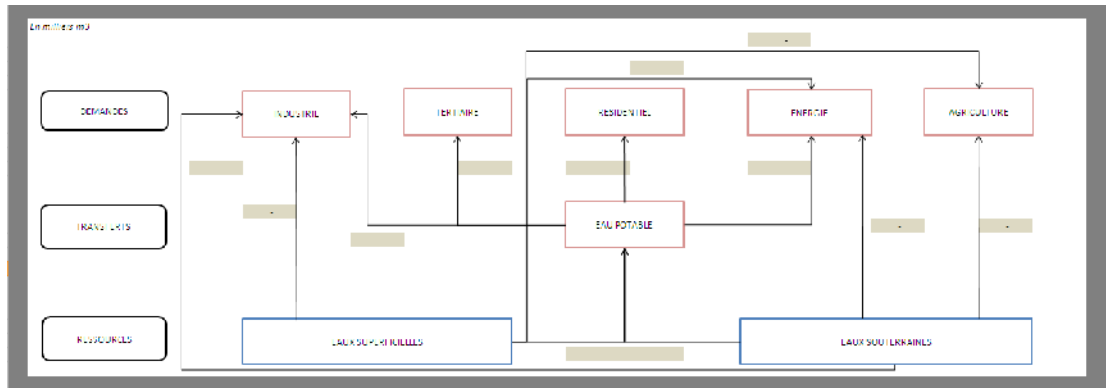
Figure 3: illustration of the available outputs in Excel- withdrawals (2)

Demands
Transfers
Resources
Industry
Tertiary
Surface water
Potable water
Energy
Agriculture
Groundwater

This type of output is very interesting in order to understand the relations between the resources and the different types of water demand (via transfer like the potable water network or also the STEP). Two graphics of this type are presented in the output file: one for the withdrawals and another for the deposits.

Afterwards, each water demand sector will have a tab dedicated to focus on the characteristics of the studied territory compared to the hydrographic basin.

For example, for the agriculture and the industry:
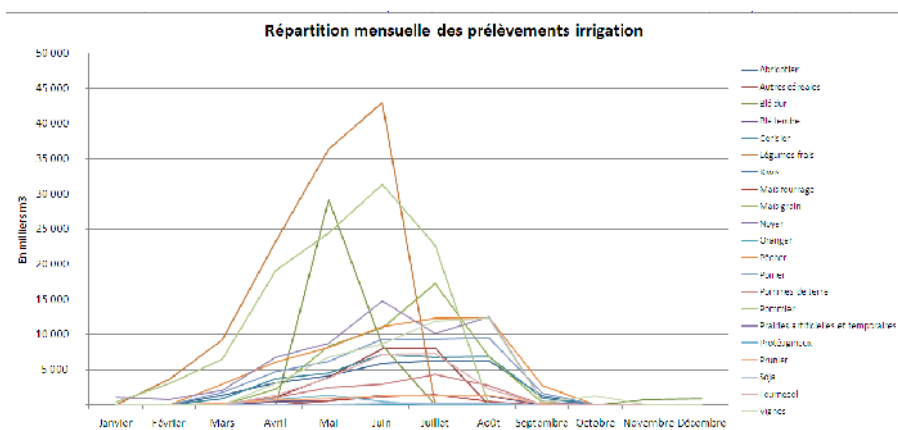
Figure 4: illustration of available outputs in Excel- Agriculture (3)

In thousands m^3

January

February
March
April
May
June
July
August
September
October
November
December

_____
Apricot
Other cereals
Durum
Wheat
Cherry
Fresh vegetables
Kiwis
Fodder maize
Grain
Walnut
Orange
Peach
Pear tree
Potato
Apple
Artificial and temporary grass
Protein
Plum tree
Soya
Sunflower
Vineyard
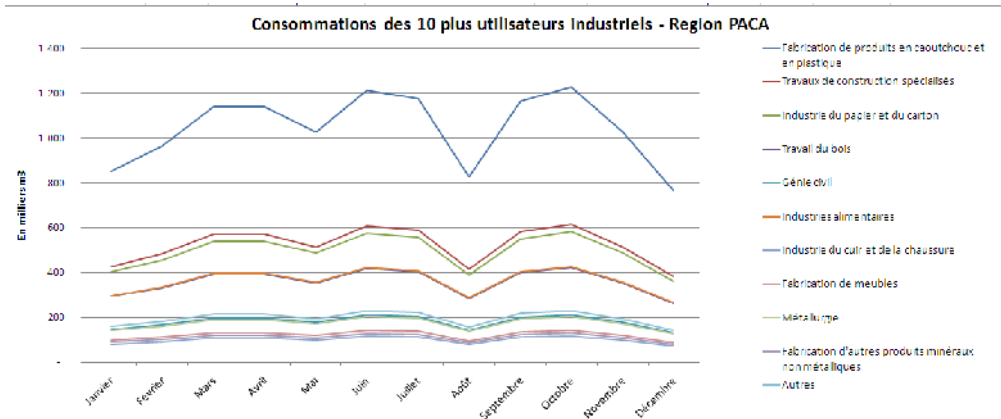
Figure 5: illustration of available outputs in Excel- Industry (4)

Consumptions of 10 additional industrial users- PACA region
In thousands m^3
January
February
March
April
May
June
July
August
September
October
November
December
_____

Manufacturing of rubber and plastic products
Specialized constructions
Paper and cartoon industry
Wood works
Civil engineering
Food industry
Leather and shoe industry
Furniture manufacturing
Metallurgy
Manufacturing of other mineral and non metal products
Others

In these sectorial tabs, a good description of each water demand sector is proposed to show the different actions of the makers.

Finally, the tabs according to the resource type (surface water, groundwater, non conventional) are present. As mentioned before, the interesting issue in these results is in the temporal variation of available water quantities. The graphs permit to put the water demand in front of the corresponding resource and to check as well if the demand exceeds or not the renewable water resource of the chosen year.
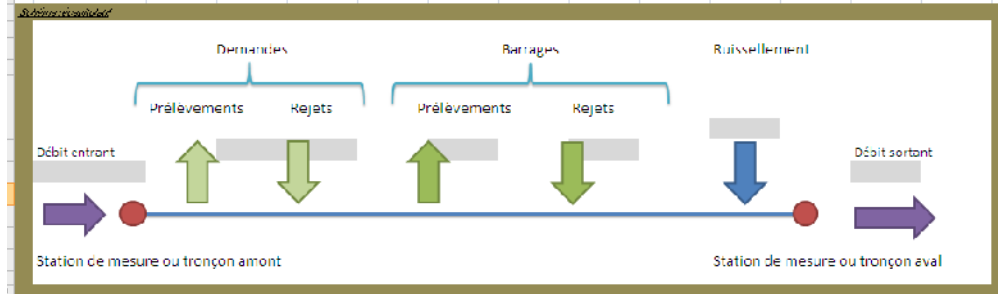
Figure 6: illustration of available outputs in Excel- Surface water (5)

Incoming flow
Measuring station or upstream section
Demands: withdrawals, deposits
Dams: withdrawals, deposits
Run off
Outgoing flow
Measuring station or downstream section

Via SQL applications

The website authorizes the confirmed users to create the proper applications in order to go further into the exploitation of the data base.
Moreover this functionality requires advanced knowledge in SQL, thus it will not be permitted to all users.

Figure 7: illustration of SQL application

Code/rights/dependencies/references/details/execution profile
Actions
CURSOR DATA_CUR IS
SELECT fe. ID_ TERRITORY, fe.YEAR, fe.MONTHLY, ces. Code_domain, es.dinf
.RAIN_EFF*PCT_INFILTRATION D
. t.surface_com
. NVL (surf.surf_irrig,0) surf_irrig
.NVL (t.surface_com*t.pct_urb_perm,0) as surf_urb
. fe.pct_infiltration
. nb_es.nb_slopes
FROM (
SELECT ID_TERRITORY, YEAR, MONTH,
SUM (DECODE (ID_FE, 3 VALUE, 0) RAIN_EFF,
SUM (DECODE (ID_FE, 8 VALUE, 0) PCT_INFILTRATION
FROM FE
GROUP BY ID_ TERRITORY, YEAR, MONTH
) fe
JOIN TERRITORIES t ON t.idterritories=fe.id_territory
JOIN COM_EAUXSOUT ces ON ces.id_territory=fe.id_territory
JOIN (
SELECT ID_TERRITORY, COUNT(*) nb_slopes

15

FROM COM_EAUXSOUT
GROUP BY ID_ TERRITORY
) nb_es ON nb_es.id_territory=fe.id_territory
JOIN EAUX_SOUT es ON es.code_domain=ces.code_domain
LEFT JOIN (
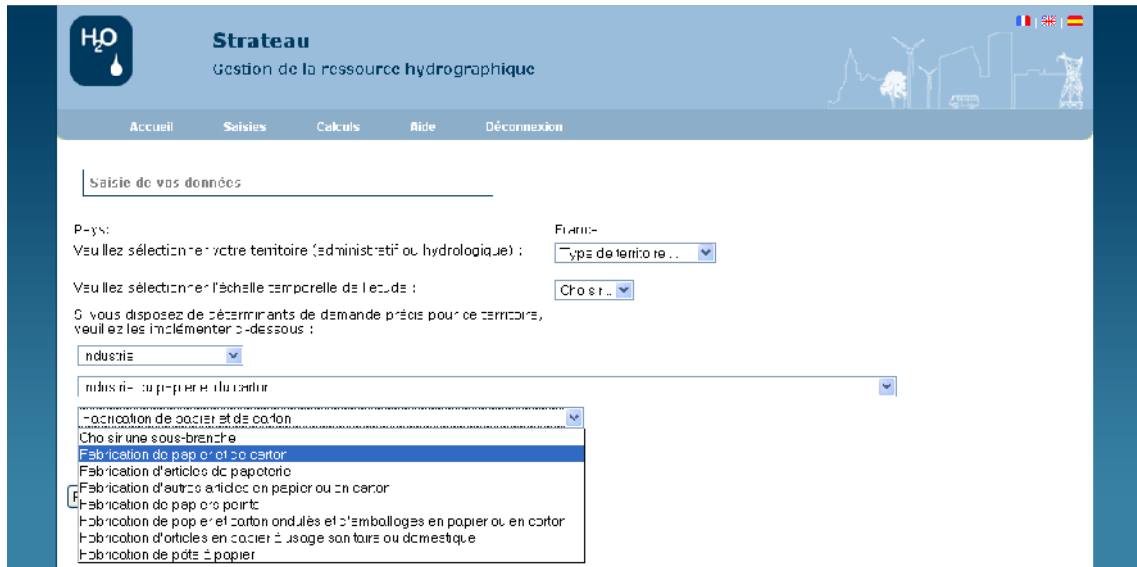SELECT s.id_territory, SUM (s.supeficial*pi.pct_irrig)/100 surf_irrig
FROM SUPERFICIAL

Using the website

The website address permits the accessing to STRATEAU is the following:
http://strateau.zen-conseil.com/

After writing your user name and your password, you access to the home page of STRATEAU. It presents the possible offers by the tool.
The tab "attach" allows the access to the page where you can choose your territory to be studied, the year model, modifying a number of parameters (production determinants, hypothesis, climatic parameters…) in order to create your proper scenario of prospective.

STRATEAU

Hydrographic resource management

Home   attach   calculations   help   disconnection

Attach your data

Country: France

Territory type

Territory type

Administrative Territory

Hydrologic Territory

Please select your territory (administrative or hydrologic):

Please select the temporal scale of study:

If you dispose the determinants of the water demand for the territory,

Please implement them as below:

Choose a sector

Reinitialize   Register

STRATEAU

Hydrographic resource management

Home   attach   calculations   help   disconnection

Attach your data

Country: France

Territory type

Please select your territory (administrative or hydrologic):

Please select the temporal scale of study:

If you dispose the water demand determinants for the territory,

Please implement them as below:

Industry
Industry of paper and cartoon
Paper and cartoon manufacturing
Choose one of the below branches
Paper manufacturing
Other paper or cartoon manufacturing
Wall paper manufacturing
Paper and undulate cartoon and paper or cartoon packaging manufacturing
Paper of household and sanitary use manufacturing
Paper pulp manufacturing

Once the values are implemented, they should be saved (by pressing the adequate button in the page footer) and start the calculations in the "calculations" tab in order to obtain the stimulation results.

STRATEAU
Hydrographic resource management

Home   attach   calculations   help   disconnection
Model evaluation
Start the calculation

Finally, the "Help" tab proposes the user guide then the methodological note allowing to understand more deeply the methods being used in STRATEAU.