

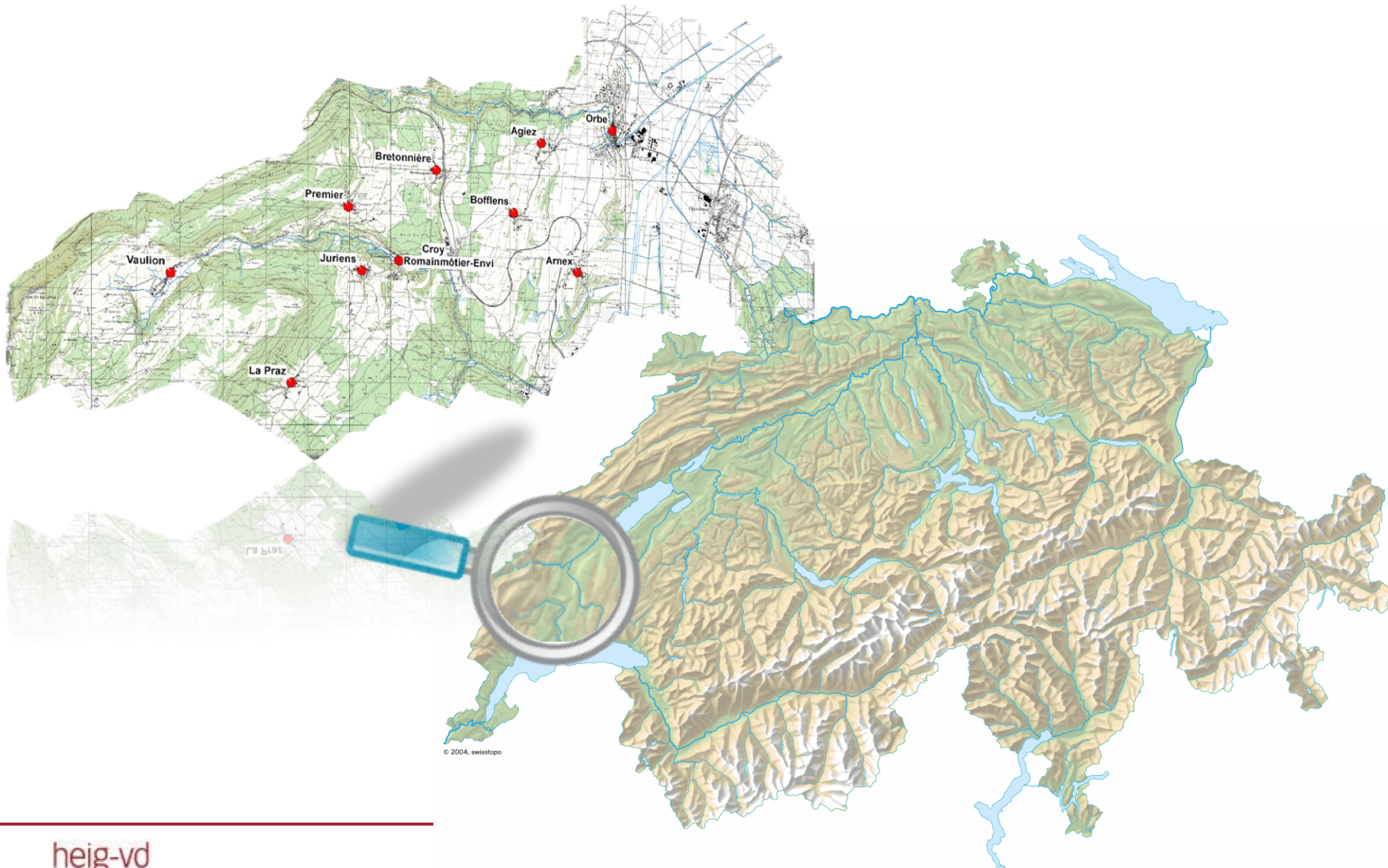
# **Participatory Multicriteria Analysis to adjust a rural development project close to regional identity in respect with local constraints**

**Projet VOTERR**

# Plan

- 1. Context**
- 2. Stakeholders**
- 3. Indicators**
- 4. Choosing the method**
- 5. Representing the weights sets**
- 6. Alternatives**
- 7. Assessing the alternatives**
- 8. Results**
- 9. Limits and perspectives**
- 10. Conclusion**

# Geographical context



# Context and aims

## Project problematic

- **Reducing building zones exceeding regulation ratios in rural regions**
  - Template project, financed by the swiss government

## Aim

- **Test zone for Switzerland**
- **Will to go for a participative approach**

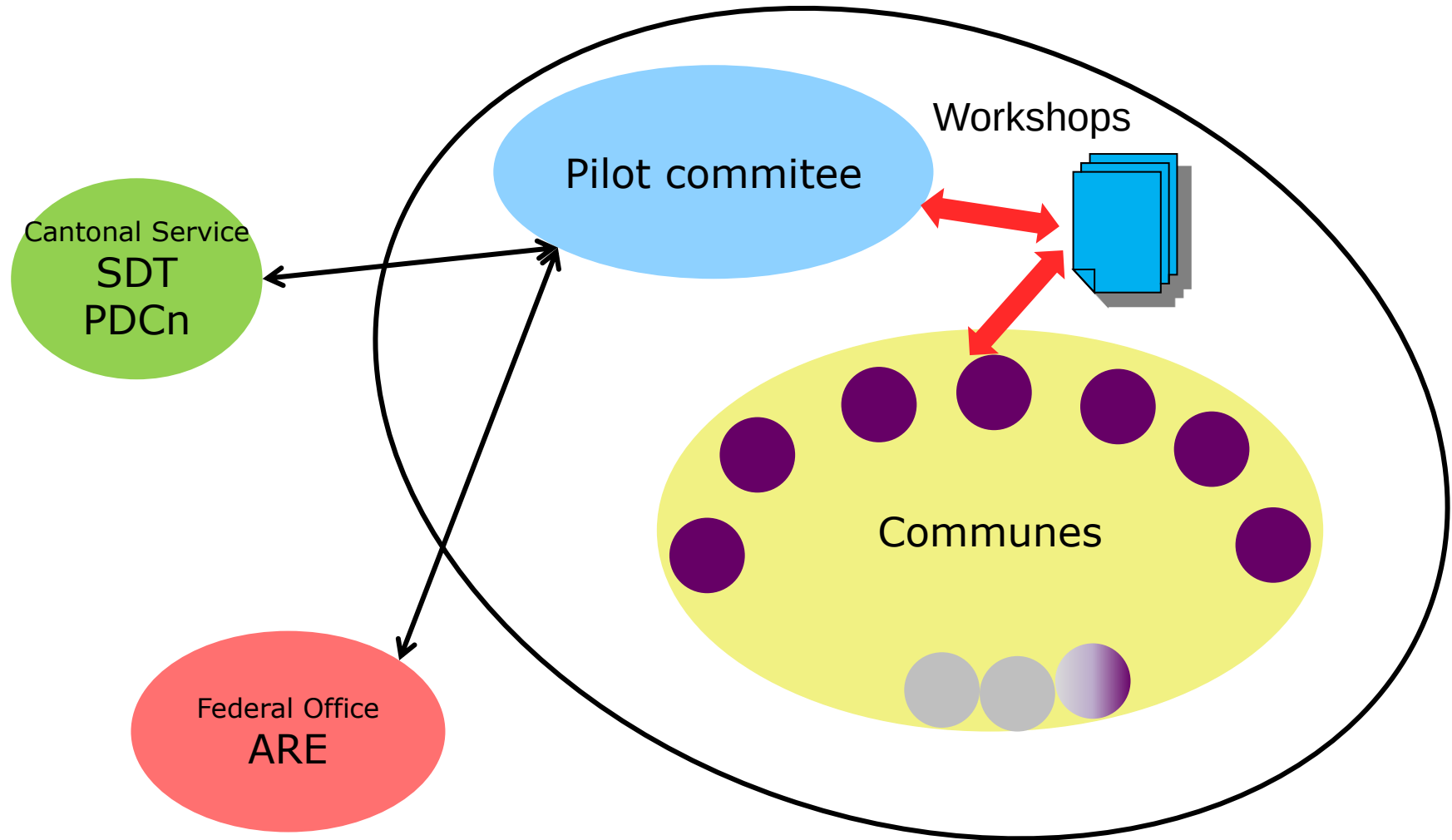
# Context and aims

## Aim

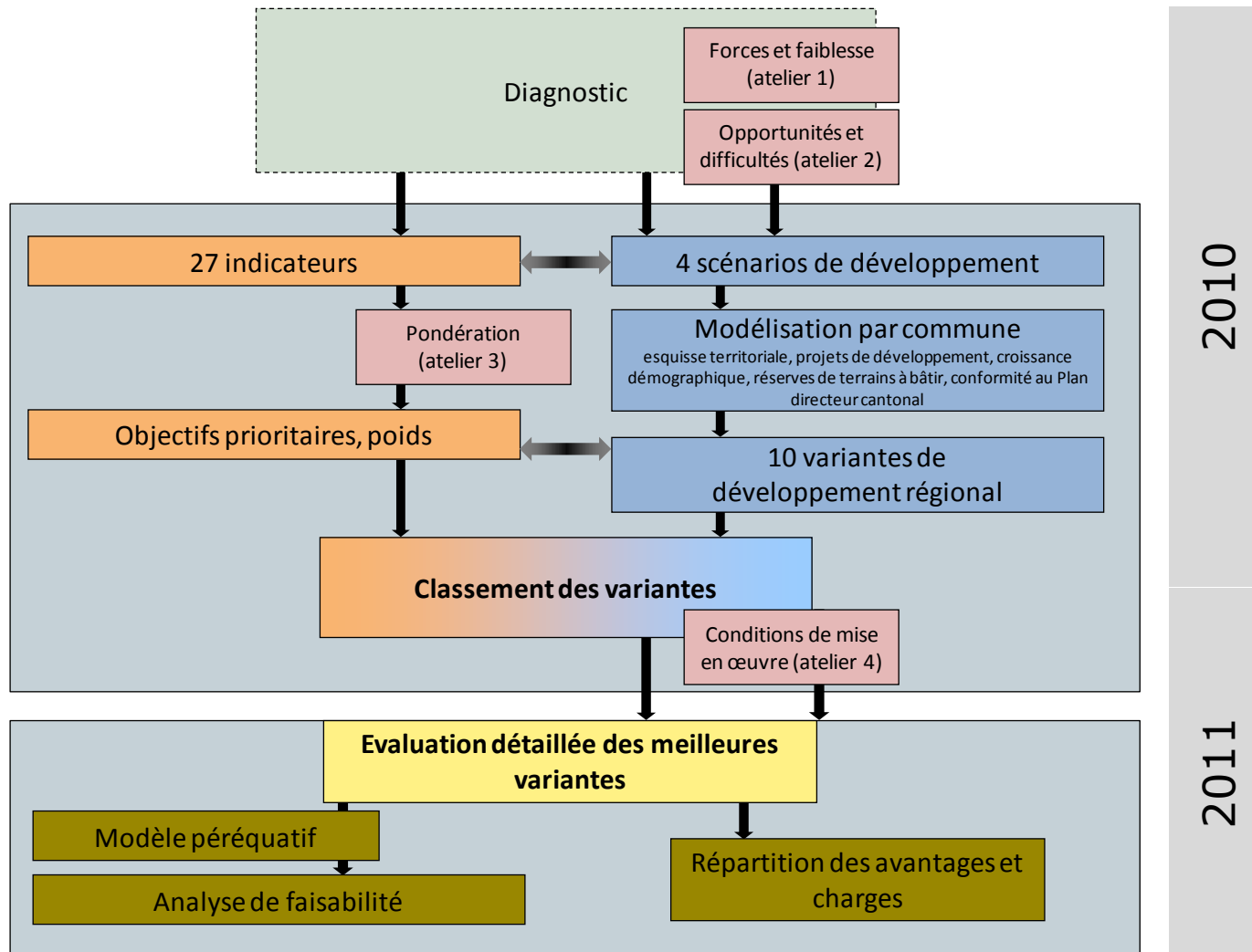
- **Finding solution(s) to the problem**
  - Comparing alternatives through several criteria

| VALLON DU NOZON |                    |                                                                   |                                               |
|-----------------|--------------------|-------------------------------------------------------------------|-----------------------------------------------|
| Commune         | Population<br>2008 | Potentiel habitants<br>supplémentaires<br>selon fiche A11<br>PDCn | Zones<br>intermédiaires                       |
| Agiez           | 256                | 162 (+63%)                                                        | 12'600 m <sup>2</sup> (villas<br>soumise PQ)  |
| Arnex-sur-Orbe  | 577                | 117 (+20%)                                                        | 17'200 m <sup>2</sup><br>(activités)          |
| Bofflens        | 172                | 54 (+31%)                                                         | 11'000 m <sup>2</sup> (villas<br>soumise PQ)  |
| Brettonnières   | 203                | 125 (+62%)                                                        | 13'800 m <sup>2</sup> (habitat)               |
| Croy            | 307                | 174 (+57%)                                                        | 16'400 m <sup>2</sup> (habitat,<br>public)    |
| Juriens         | 270                | 155 (+57%)                                                        | 14'100 m <sup>2</sup> (habitat)               |
| La Praz         | 152                | 76 (+50%)                                                         | -                                             |
| Premier         | 187                | 24 (+13%)                                                         | 37'800 m <sup>2</sup> (habitat)               |
| Romainmôtier    | 465                | 125 (+27%)                                                        | 17'600 m <sup>2</sup> (habitat)               |
| Vaulion         | 459                | 55 (+12%)                                                         | 19'600 m <sup>2</sup> (habitat,<br>activités) |
| Total           | 3048               | 1067 (+35%)                                                       |                                               |

# Stakeholders



# Project planning



# Indicators

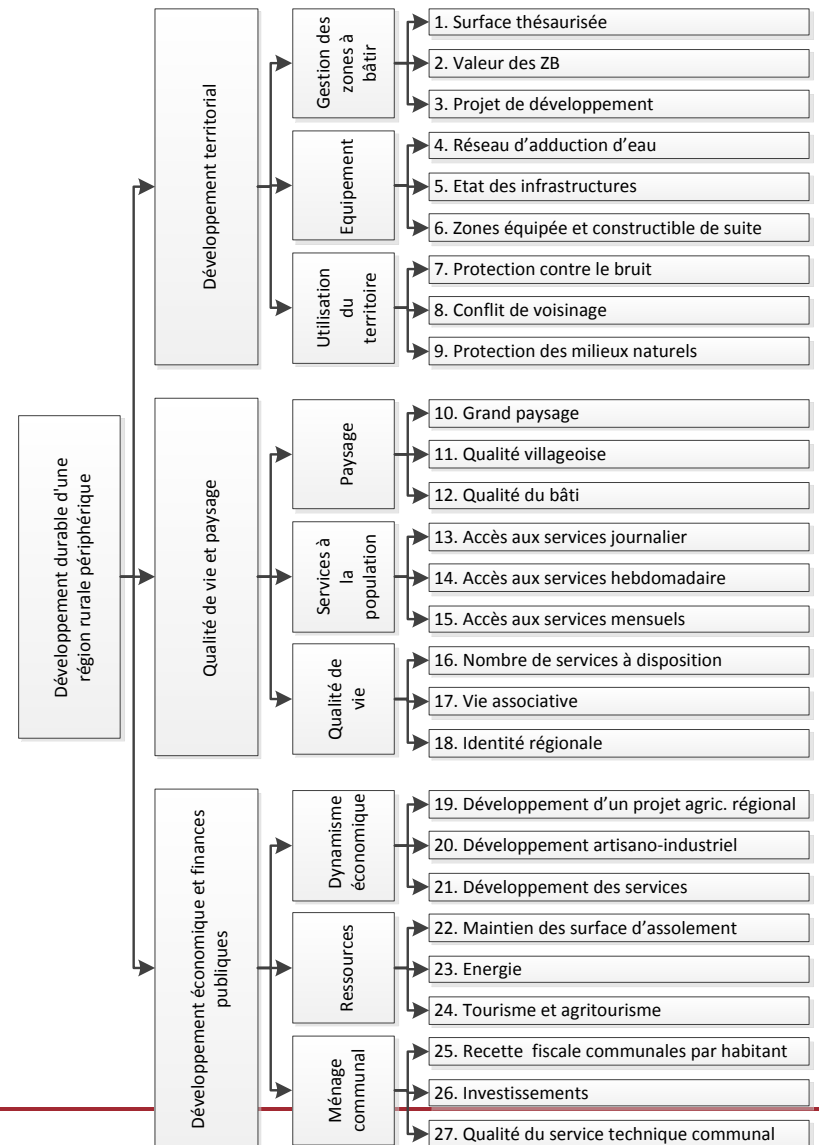
- **Indicators system**

- Defined by a subset of the pilot committee
  - Built upon inhabitants preoccupations :
    - Quality of life and landscape
    - Access to services
    - Durability of communal finances
  - Respect of state regulations



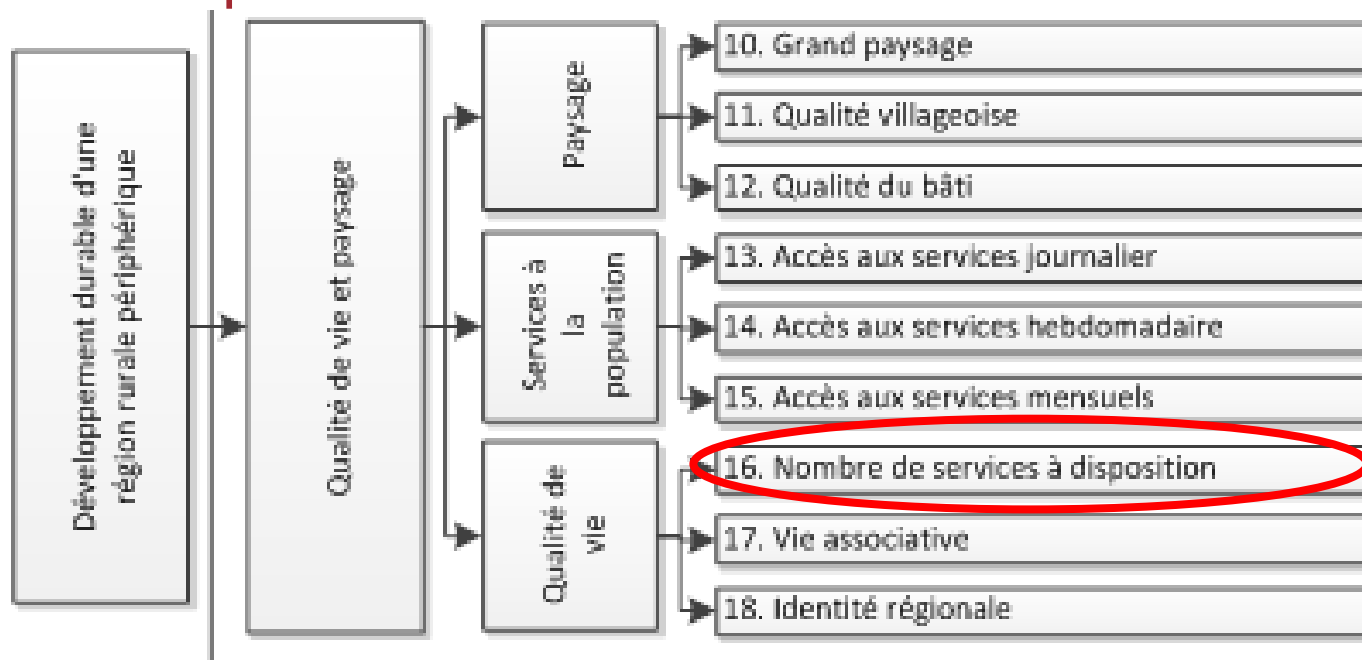
# Indicators

- **27 indicators**
  - Hierarchically organised
    - Leads to strong constraints

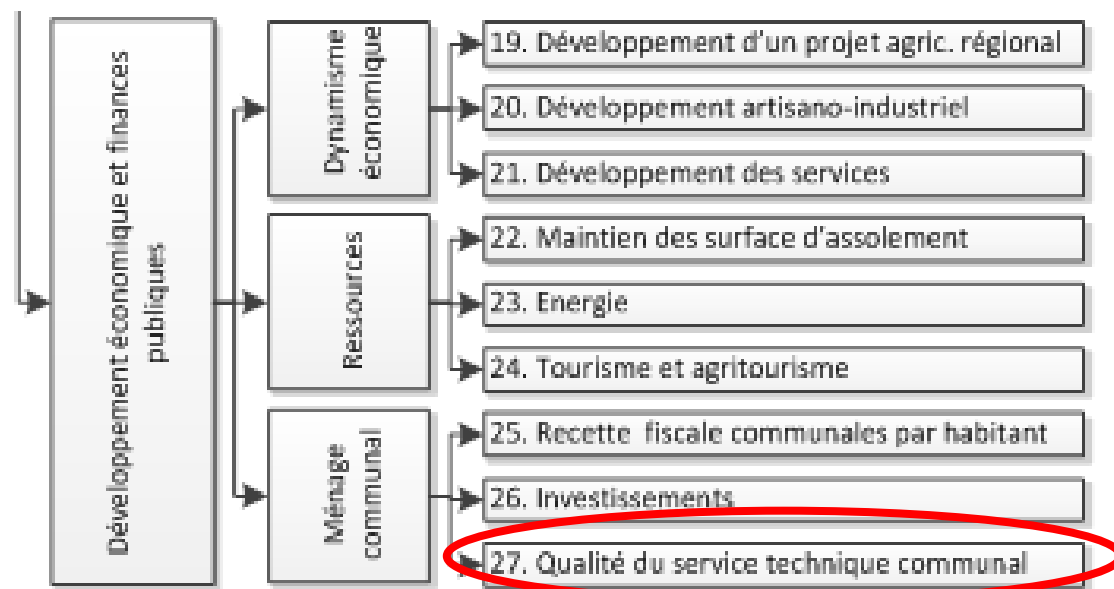


# Indicators

- **Difficult to build the indicators system because of constraints**
  - 2 examples



# Indicators



# Choosing the method

- **Diverse indicators**

- Assess among other things:
  - Square meters
  - Quality of life
  - Timetable for public transportation
  - % of thezaurized surfaces
  - ...

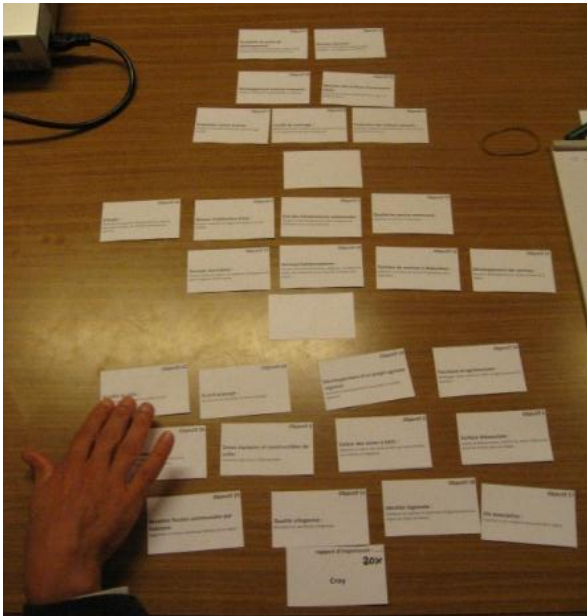
- **Several stakeholders**

- Multiple weighting sets
- Choice of a method ordering alternatives

ELECTRE III

# Weighting

- **3 weighting approaches**
  - Direct method (points on hierarchic levels)
  - Cards method (Simos system)
  - Shared weights (silent negotiation)



# Weighting

## Bretonnières

### Pondération directe (valeurs)

|                 |    |     |     |      |        |
|-----------------|----|-----|-----|------|--------|
| 20              | 60 | 1   | 45  | 5.4% |        |
|                 |    | 2   | 10  | 1.2% |        |
|                 |    | 3   | 45  | 5.4% |        |
|                 | 20 | 4   | 80  | 3.2% |        |
|                 |    | 5   | 10  | 0.4% |        |
|                 |    | 6   | 10  | 0.4% |        |
|                 | 20 | 7   | 25  | 1.0% |        |
|                 |    | 8   | 50  | 2.0% |        |
|                 |    | 9   | 25  | 1.0% |        |
| 20              | 10 | 10  | 10  | 0.2% |        |
|                 |    | 11  | 45  | 0.9% |        |
|                 |    | 12  | 45  | 0.9% |        |
|                 | 45 | 13  | 75  | 6.8% |        |
|                 |    | 14  | 20  | 1.8% |        |
|                 |    | 15  | 5   | 0.5% |        |
|                 | 45 | 16  | 20  | 1.8% |        |
|                 |    | 17  | 30  | 2.7% |        |
|                 |    | 18  | 50  | 4.5% |        |
| 60              | 35 | 19  | 35  | 7.4% |        |
|                 |    | 20  | 30  | 6.3% |        |
|                 |    | 21  | 35  | 7.4% |        |
|                 | 35 | 22  | 30  | 6.3% |        |
|                 |    | 23  | 35  | 7.4% |        |
|                 |    | 24  | 35  | 7.4% |        |
|                 | 30 | 25  | 45  | 8.1% |        |
|                 |    | 26  | 45  | 8.1% |        |
|                 |    | 27  | 10  | 1.8% |        |
| Total           |    | 100 | 300 | 900  | 100.0% |
| Rapport Max/min |    |     |     |      | 40.5   |

## Bretonnières

### Pondération indirecte (cartes)

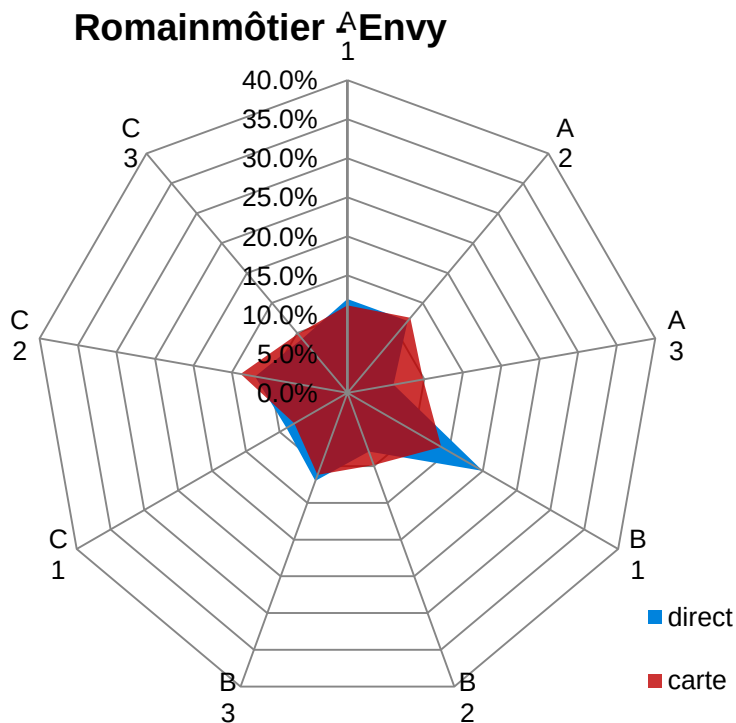
#### Rapport d'importance

6

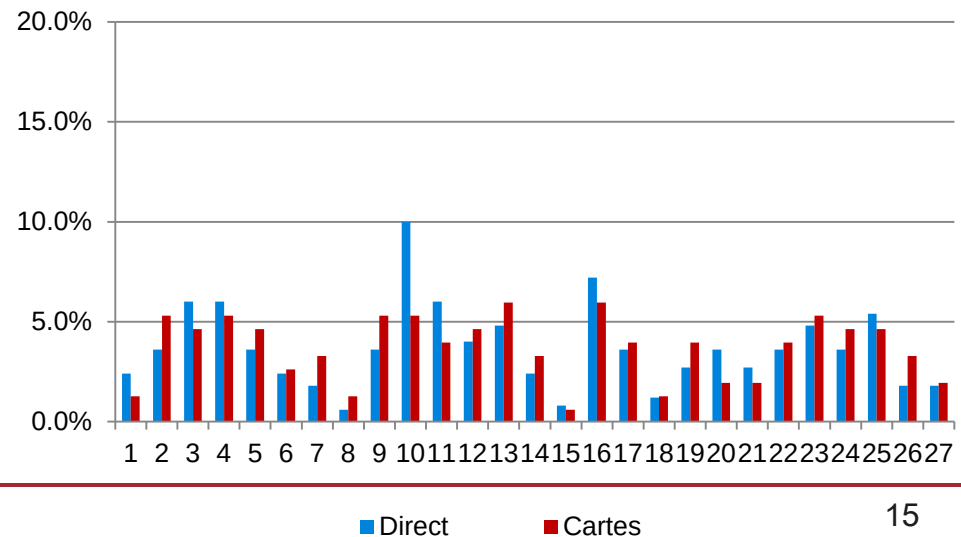
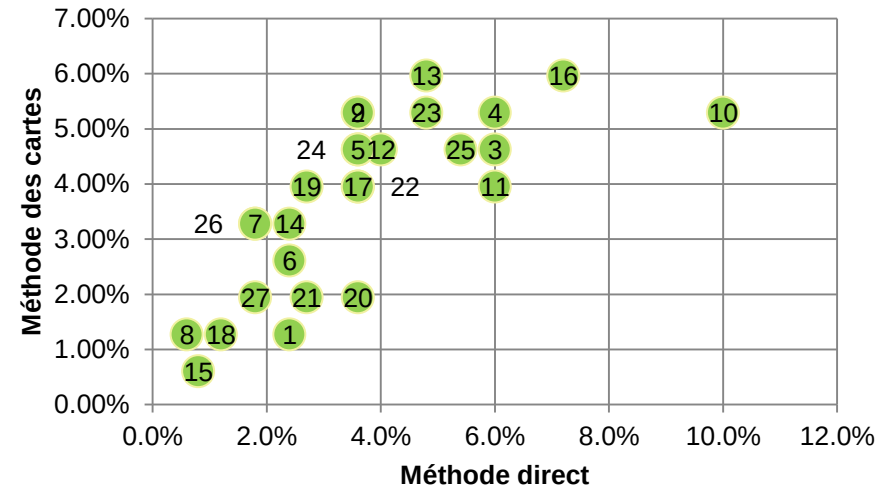
|               |       |    |    |    |    |    | Niveau | Nb cartes | Somme | Poids ligne % | Poids % |       |
|---------------|-------|----|----|----|----|----|--------|-----------|-------|---------------|---------|-------|
| peu important | 3     | 7  | 18 | 15 |    |    | 1      | 1.0       | 4     | 4             | 3.96%   | 0.99% |
|               | 2     | 22 | 17 | 21 |    |    | 2      | 2.0       | 4     | 8             | 7.92%   | 1.98% |
|               | 16    | 24 | 20 | 19 |    |    | 3      | 3.0       | 4     | 12            | 11.88%  | 2.97% |
|               | 6     | 12 | 14 | 13 |    |    | 4      | 4.0       | 4     | 16            | 15.84%  | 3.96% |
| important     | 1     | 8  | 11 | 27 | 25 |    | 5      | 5.0       | 5     | 25            | 24.75%  | 4.95% |
|               | 4     | 5  | 9  | 10 | 23 | 26 | 6      | 6.0       | 6     | 36            | 35.64%  | 5.94% |
|               | Somme |    |    |    |    |    |        |           | 27    | 101           | 100.0%  |       |

# Representing the weights

- Typical weights set

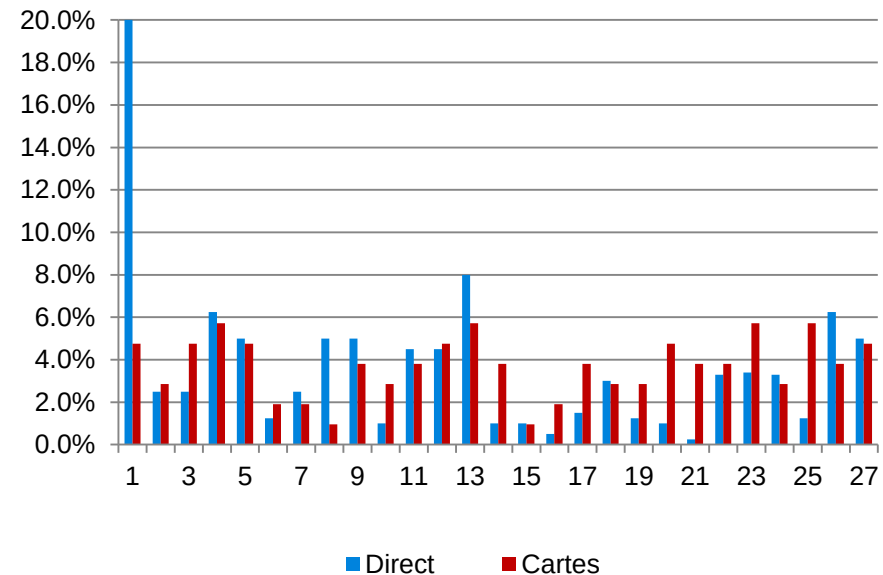
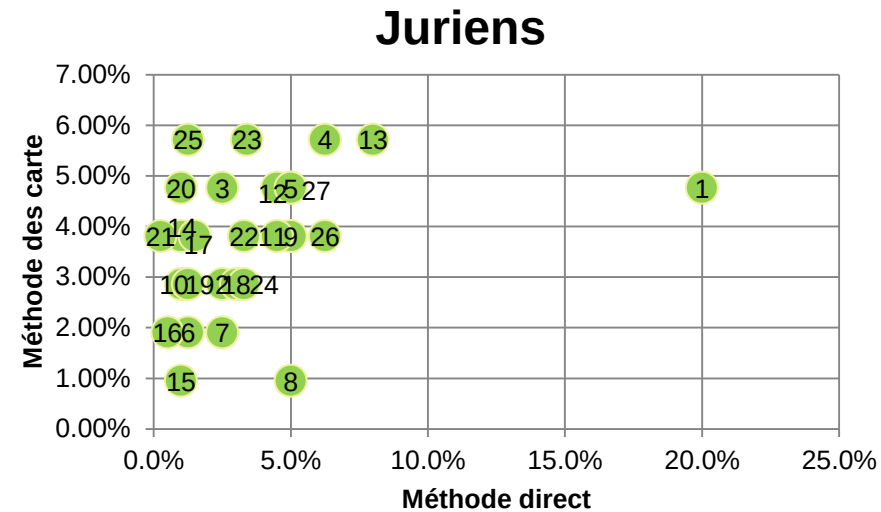
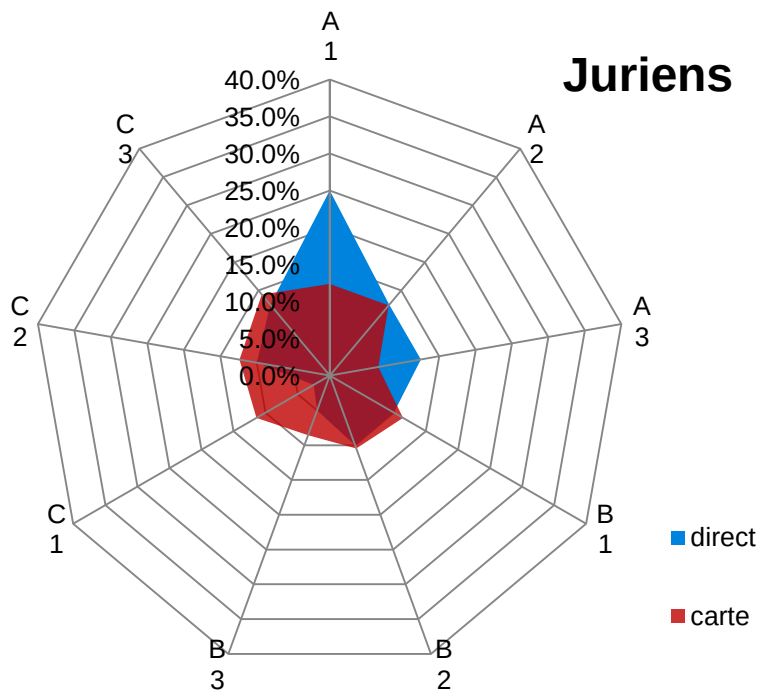


## Romainmôtier - Envy



# Representing the weights

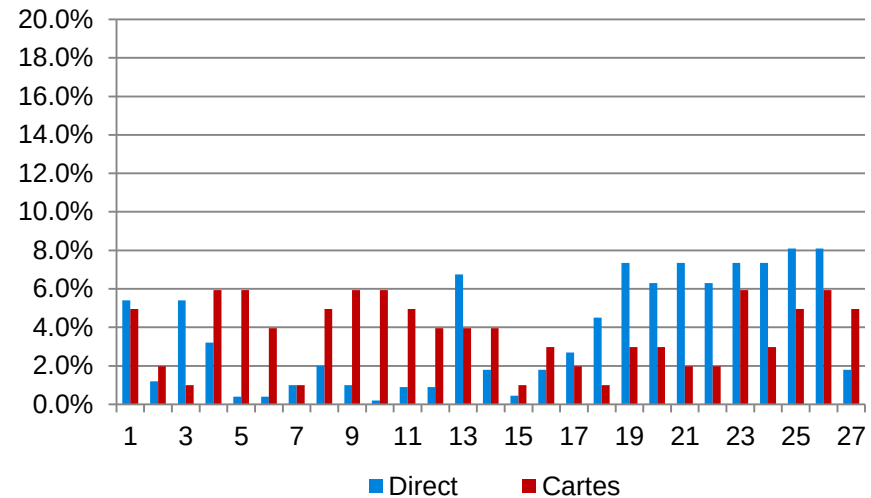
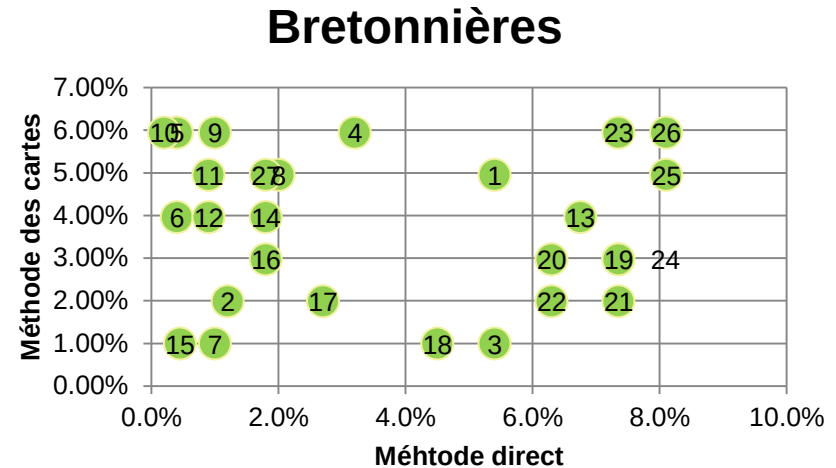
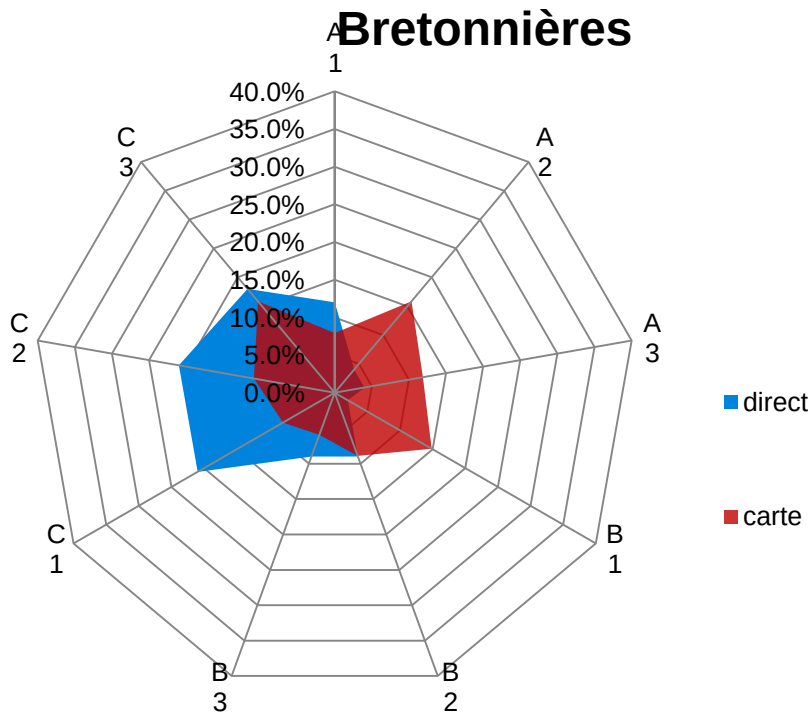
- Specific case 1





# Representing the weights

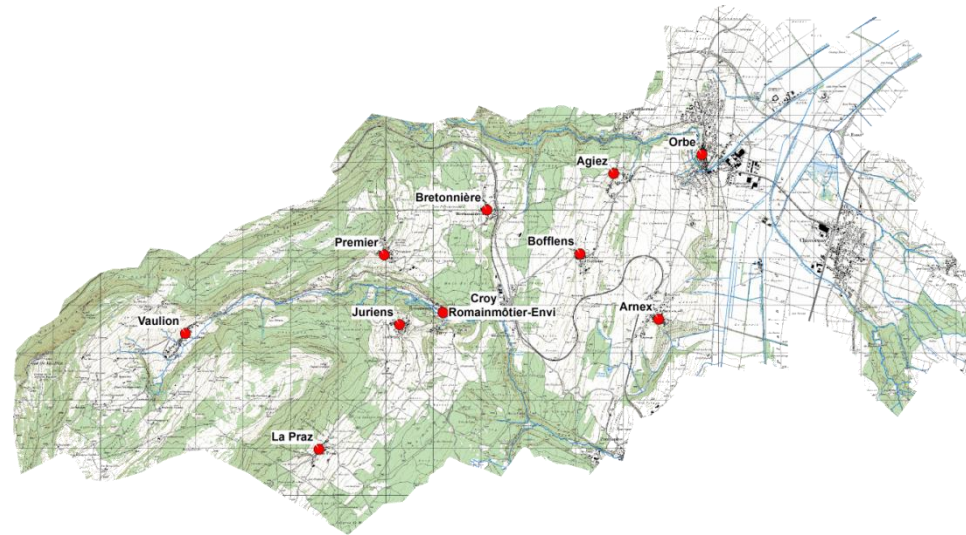
- Specific case 2



# Using the weighting

- **Discovering common points of view**
  - Analysing the different representation highlighted similarities in between communes

| priorités                                | Communes très sensibles à la question des réserves de terrain à bâtir | Communes peu ou moyennement sensibles à la question des réserves de terrain à bâtir |
|------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Services<br>Energie<br>Tranquillité      | Juriens                                                               | La Praz<br>Premier                                                                  |
| Services<br>Développement économique     | Bretonnières                                                          | Vaulion                                                                             |
| Services<br>Paysage<br>Centre local fort | Croy                                                                  | Romainmôtier                                                                        |



# Alternatives

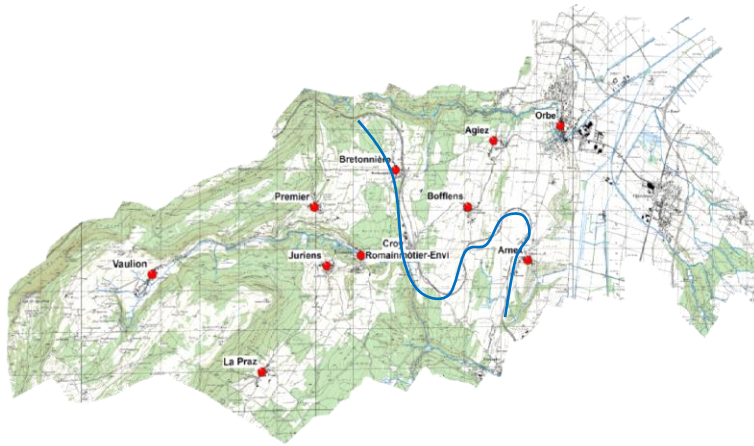
4 options (called scenarios) in between communes can choose

1. Statut quo
  2. Centered on Orbe (regional center)
  3. Links to a local center
  4. Links to a local center with financial perequation
- Alternatives are a combination of options for each commune

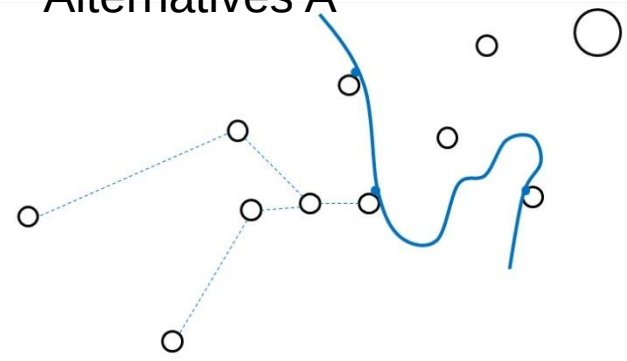
# Alternatives

- **Choosing the alternatives**
  - No combinatory approach (unrealistic)
  - Realistic and achievable alternatives
  - Based on communes wishes
  - Derived from weighting sets and analyse

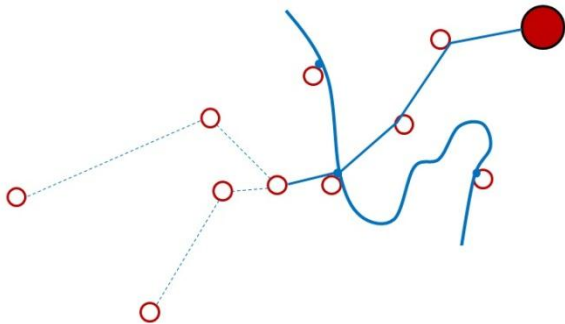
# Alternatives



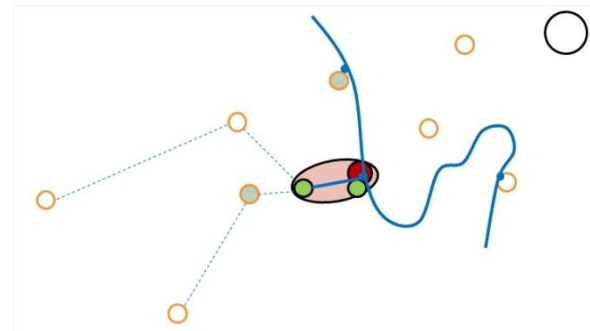
Alternatives A



Alternatives B

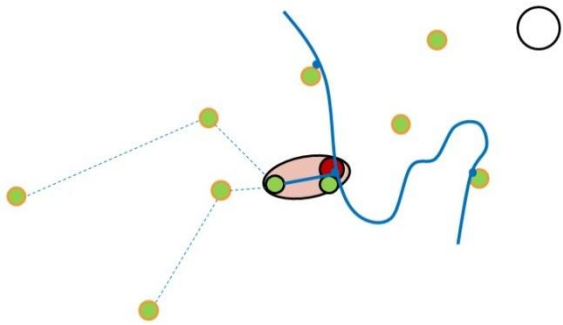


Alternatives C

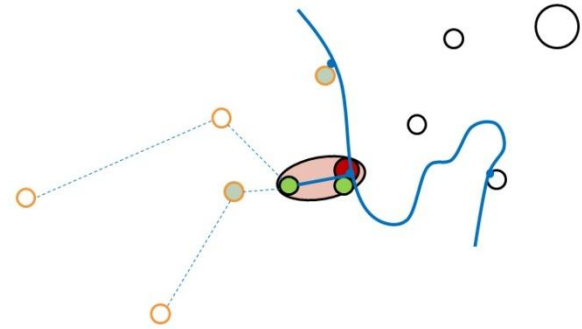


# Alternatives

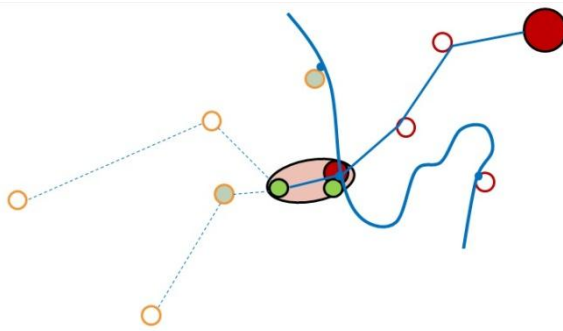
Alternatives D



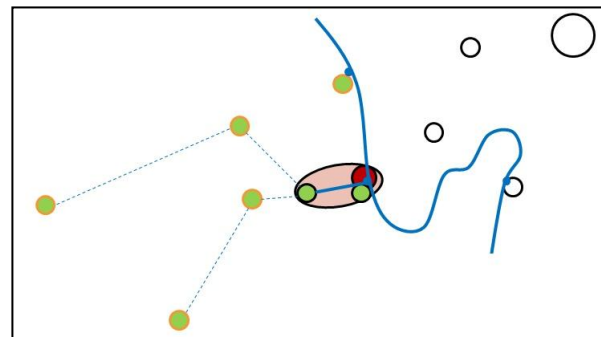
Alternatives E



Alternatives F

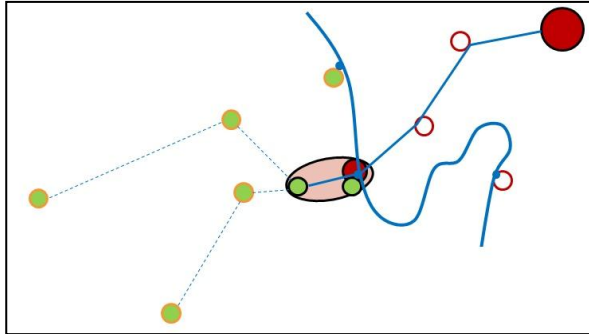


Alternatives G

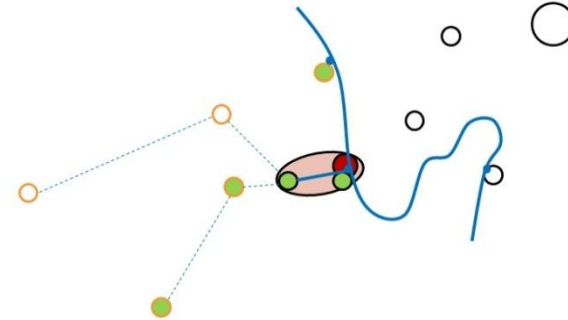


# Alternatives

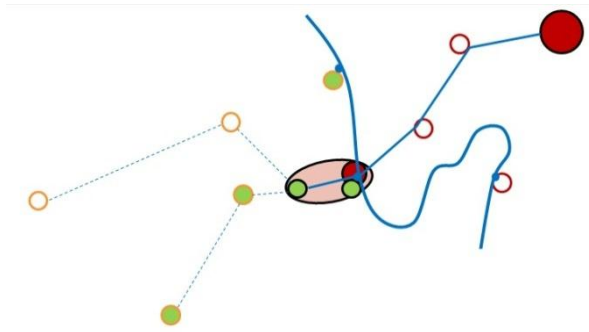
Alternatives H



Alternatives I



Alternatives J



- All alternatives are realistic and achievable but alternative A: Problem of non-legal aspects, but corresponds of the global statu quo situation, e.g. «zero alternative»

# Assessing the alternatives

- **Different evaluation approaches:**
  - By calculation
  - By expert assessment
    - Ordering alternatives for a given indicator
    - Points



# Assessing the alternatives

|       | Unité              | Min  | Max  | Sens        | Pondération | Var A | Var B | Var C | Var D | Var E | Var F | Var G | Var H | Var I | Var J |
|-------|--------------------|------|------|-------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| OD 1  | %                  | 0    | 100  | Décroissant | 3.8%        | 48%   | 48%   | 29%   | 0%    | 29%   | 29%   | 17%   | 17%   | 20%   | 20%   |
| OD 2  | 10 <sup>3</sup> ha | 10.6 | 16.5 | Croissant   | 2.5%        | 10.6  | 10.6  | 12.5  | 16.4  | 12.5  | 12.5  | 16.3  | 16.3  | 16.5  | 16.5  |
| OD 3  | ha                 | 9.6  | 16.4 | Croissant   | 1.8%        | 9.6   | 9.6   | 12.0  | 16.4  | 12.0  | 12.0  | 15.9  | 15.9  | 16.1  | 16.1  |
| OD 4  | Ordinal            | -    |      | Croissant   | 5.1%        | 1     | 1     | 5     | 6     | 2     | 4     | 2     | 4     | 2     | 3     |
| OD 5  | Ordinal            | -    |      | Croissant   | 5.1%        | 1     | 3     | 6     | 7     | 1     | 4     | 2     | 5     | 2     | 3     |
| OD 6  | %                  | 0    | 100  | Croissant   | 1.8%        | 61%   | 56%   | 50%   | 29%   | 50%   | 50%   | 38%   | 39%   | 37%   | 37%   |
| OD 7  | Note               | 0    | 10   | Croissant   | 3.8%        | 1     | 1     | 10    | 4     | 10    | 10    | 6     | 6     | 9     | 9     |
| OD 8  | Note               | 0    | 10   | Croissant   | 3.8%        | 1     | 1     | 3     | 10    | 3     | 3     | 7     | 7     | 5     | 5     |
| OD 9  | Note               | 0    | 10   | Croissant   | 5.1%        | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     | 1     |
| OD 10 | Note               | 0    | 10   | Croissant   | 3.1%        | 1     | 1     | 7     | 10    | 5.5   | 5.5   | 7     | 7     | 6     | 6     |
| OD 11 | Note               | 0    | 10   | Croissant   | 5.1%        | 2     | 2     | 4     | 10    | 4     | 4     | 7     | 7     | 5     | 5     |
| OD 12 | Note               | 0    | 10   | Croissant   | 3.8%        | 1     | 1     | 2     | 10    | 2     | 2     | 7     | 7     | 5     | 5     |
| OD 13 | Note               | 0    | 10   | Croissant   | 5.1%        | 4     | 7     | 4.5   | 4.5   | 4.5   | 7.5   | 4.5   | 7.5   | 4.5   | 7.5   |
| OD 14 | Note               | 0    | 10   | Croissant   | 1.8%        | 8     | 10    | 8     | 8     | 8     | 10    | 8     | 10    | 8     | 10    |
| OD 15 | Note               | 0    | 10   | Croissant   | 0.5%        | 8     | 10    | 8     | 8     | 8     | 10    | 8     | 10    | 8     | 10    |
| OD 16 | Ordinal            | -    |      | Croissant   | 4.4%        | 1     | 5     | 3     | 3     | 2     | 4     | 2     | 4     | 2     | 4     |
| OD 17 | Ordinal            | -    |      | Croissant   | 3.8%        | 2     | 1     | 4     | 5     | 3     | 4     | 3     | 4     | 3     | 4     |
| OD 18 | Ordinal            | -    |      | Croissant   | 3.1%        | 2     | 1     | 6     | 7     | 4     | 3     | 5     | 3     | 5     | 3     |
| OD 19 | Note               | 0    | 10   | Croissant   | 3.8%        | 4     | 5     | 10    | 10    | 7     | 10    | 7     | 10    | 7     | 10    |
| OD 20 | Note               | 0    | 10   | Croissant   | 3.8%        | 1     | 1     | 10    | 10    | 7     | 7     | 7     | 7     | 7     | 7     |
| OD 21 | Note               | 0    | 10   | Croissant   | 2.5%        | 1     | 1     | 10    | 10    | 7     | 7     | 7     | 7     | 7     | 7     |
| OD 22 | ha                 | 0    | 1.2  | Décroissant | 3.8%        | 0     | 0     | 0.6   | 1.2   | 0.6   | 0.6   | 0.9   | 0.9   | 0.9   | 0.9   |
| OD 23 | Note               | 0    | 10   | Croissant   | 5.1%        | 1     | 1     | 10    | 10    | 7     | 7     | 7     | 7     | 7     | 7     |
| OD 24 | Ordinal            | -    |      | Croissant   | 4.4%        | 1     | 3     | 4     | 4     | 2     | 5     | 2     | 5     | 2     | 5     |
| OD 25 | Ordinal            | -    |      | Croissant   | 4.4%        | 1     | 3     | 5     | 6     | 2     | 4     | 2     | 4     | 2     | 4     |
| OD 26 | Ordinal            | -    |      | Croissant   | 4.4%        | 2     | 1     | 9     | 10    | 6     | 3     | 8     | 5     | 7     | 4     |
| OD 27 | Note               | 0    | 10   | Croissant   | 4.4%        | 0     | 10    | 10    | 10    | 7     | 10    | 7     | 10    | 7     | 10    |

# Assessing the alternatives

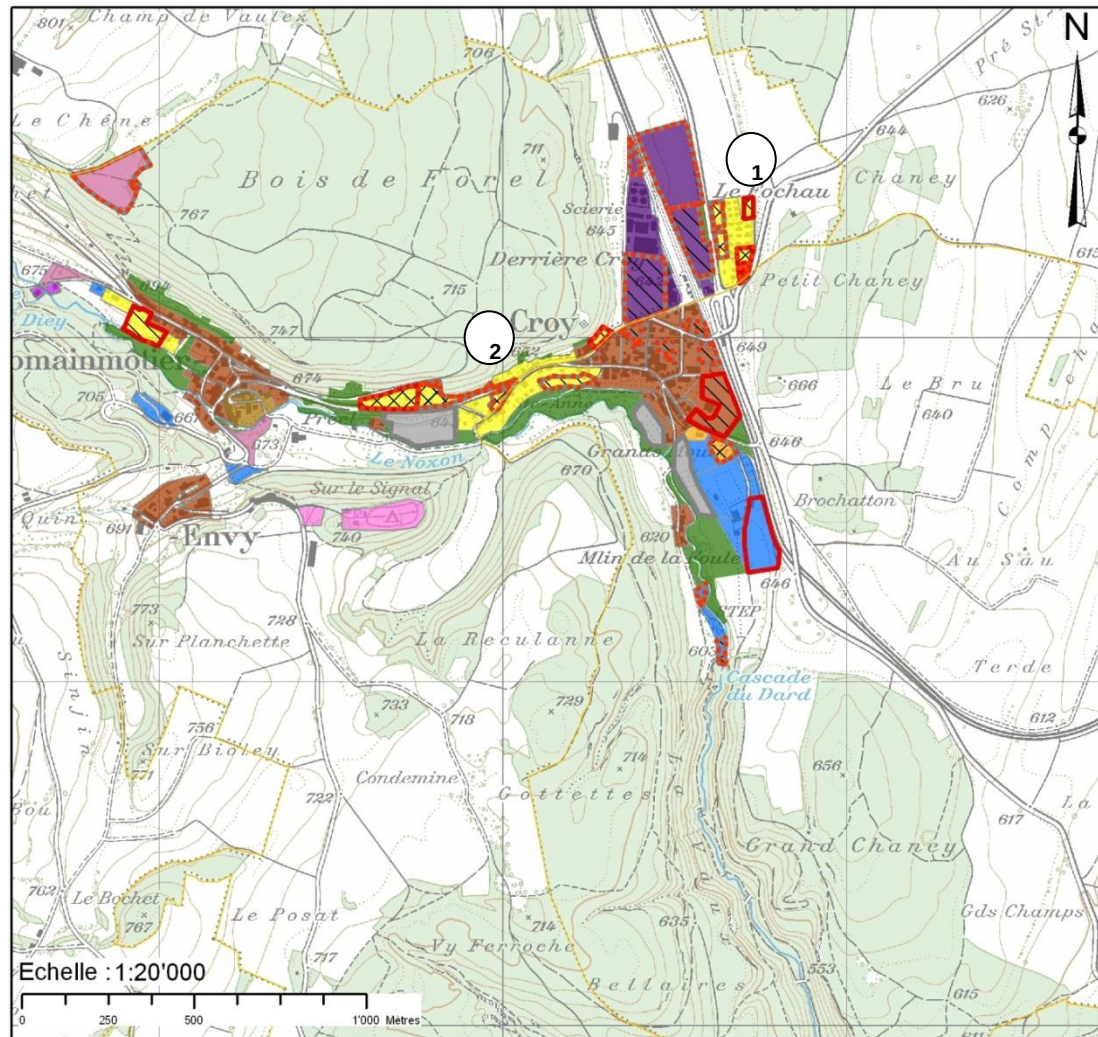
- **Example 1**

|      | Unité              | Min  | Max  | Sens               | Pondération | Var A | Var B | Var C |
|------|--------------------|------|------|--------------------|-------------|-------|-------|-------|
| OD 1 | %                  | 0    | 100  | <b>Décroissant</b> | 3.8%        | 48%   | 48%   | 29%   |
| OD 2 | 10 <sup>3</sup> ha | 10.6 | 16.5 | Croissant          | 2.5%        | 10.6  | 10.6  | 12.5  |
| OD 3 | ha                 | 9.6  | 16.4 | Croissant          | 1.8%        | 9.6   | 9.6   | 12.0  |

OD 1 (thezaurized surface)

GIS calculation based on  
alternative A (zero state)

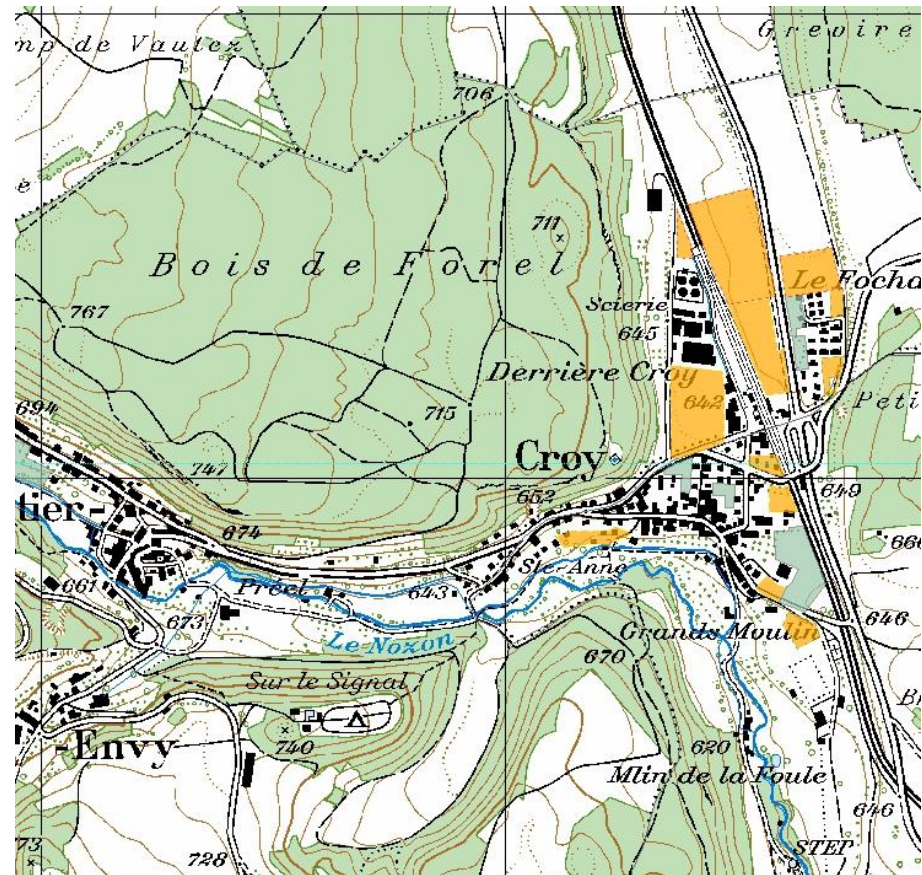
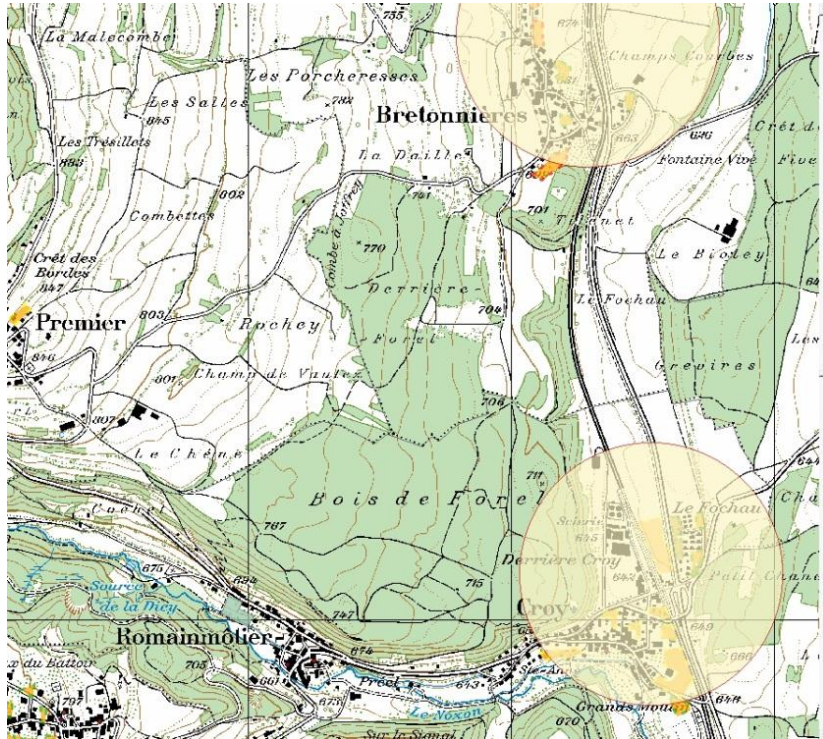
# Assessing alternatives





# Assessing alternatives

- Use of GIS



# Assessing alternatives

- **Example 2**

|      | Unité              | Min  | Max  | Sens               | Pondération | Var A | Var B | Var C | Var D |
|------|--------------------|------|------|--------------------|-------------|-------|-------|-------|-------|
| OD 1 | %                  | 0    | 100  | <b>Décroissant</b> | 3.8%        | 48%   | 48%   | 29%   | 0%    |
| OD 2 | 10 <sup>3</sup> ha | 10.6 | 16.5 | Croissant          | 2.5%        | 10.6  | 10.6  | 12.5  | 16.4  |
| OD 3 | ha                 | 9.6  | 16.4 | Croissant          | 1.8%        | 9.6   | 9.6   | 12.0  | 16.4  |
| OD 4 | Ordinal            | -    |      | Croissant          | 5.1%        | 1     | 1     | 5     | 6     |

OD 4 (water supply network)

Ordering alternatives on possible optimisation of water supply network management

# Assessing alternatives

- **Example 3**

|      | Unité | Min | Max | Sens      | Pondération | Var A | Var B | Var C | Var D |
|------|-------|-----|-----|-----------|-------------|-------|-------|-------|-------|
| OD 7 | Note  | 0   | 10  | Croissant | 3.8%        | 1     | 1     | 10    | 4     |
| OD 8 | Note  | 0   | 10  | Croissant | 3.8%        | 1     | 1     | 3     | 10    |

OD 8 (Neighborhood conflicts)

Points given for each village when the risk of conflict is reduced compare to the present state



# Assessment

- **Wish-list**

- Assessing alternatives by external experts
- Implementing finer and more complete GIS calculation

**Not done : not enough time, not enough money**

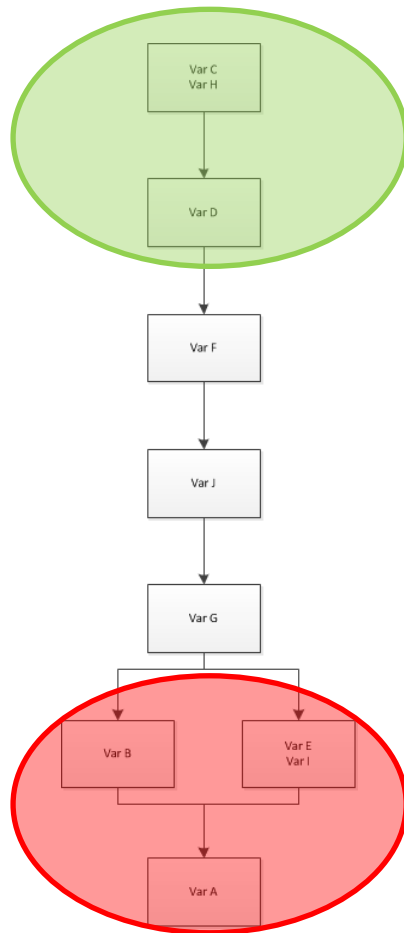
# ELECTRE

- 2 results per commune + 1 global/shared result
- Sensitivity studies on «sensitive» indicators
- Veto thresholds defined for indicator 1 (compatibility with PDCn)

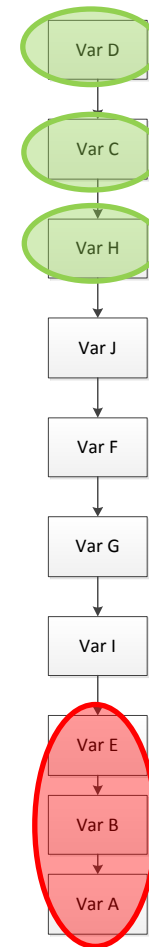


# Results

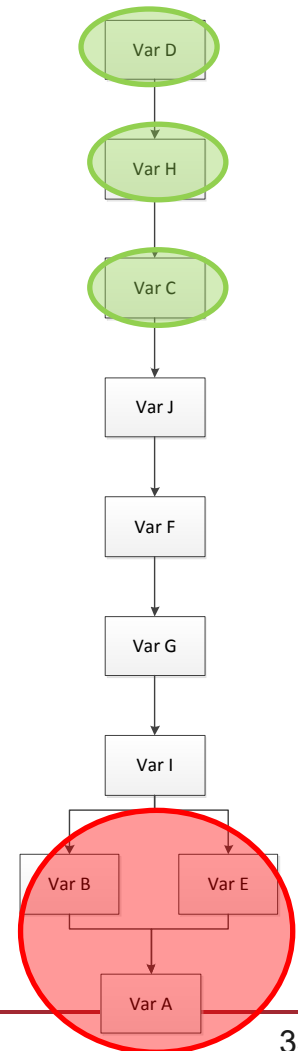
## Shared weighting



## Evaluation directe de Bretonnières

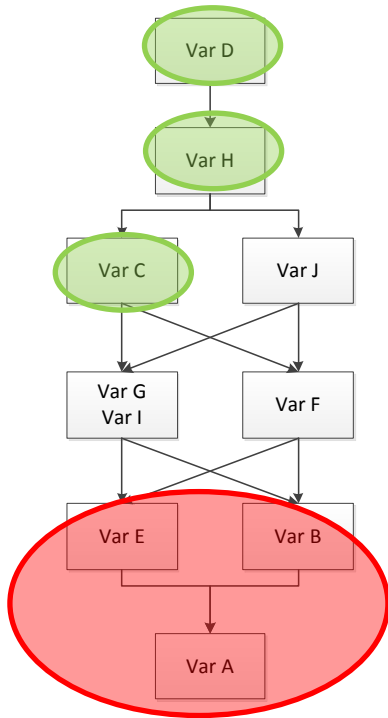


## Evaluation indirecte de Bretonnières

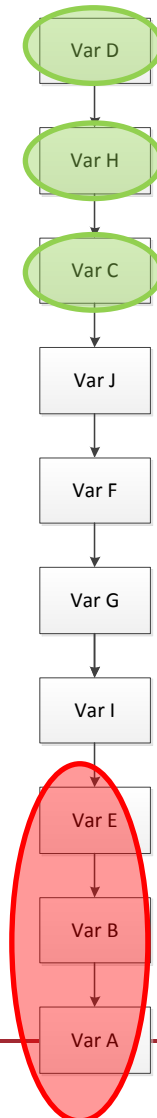


# Results

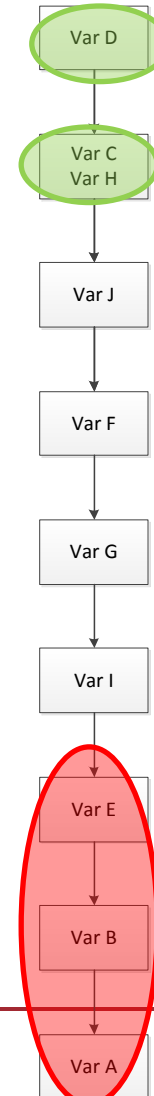
Evaluation directe de Juriens



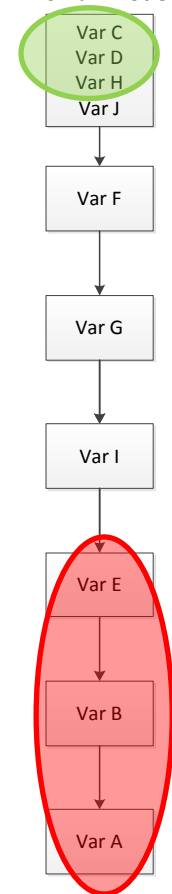
Evaluation indirecte de Juriens



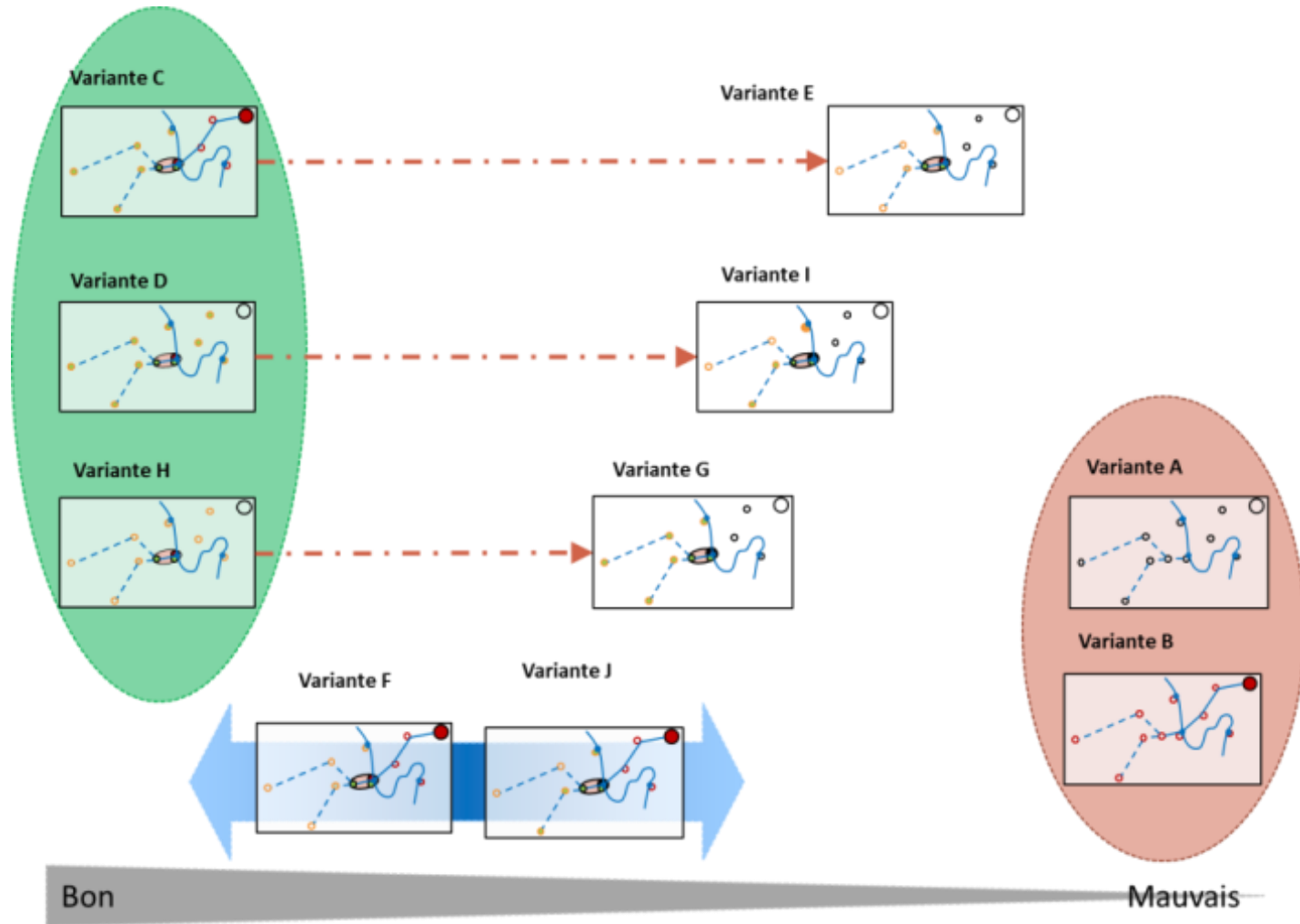
Evaluation directe de Romainmôtier



Evaluation indirecte de Romainmôtier



# Results



# Limits and perspective

- **Limited means**
  - Expertise by pilot comitee
- **Partial participation**
  - 7 communes out of 10 did participate to workshops
- **Stakeholders not enough informed on Territory planning problems**
  - Militia government
    - Part-time working executives
- **Hard to generalize «as is»**

# Last news

- **Feedbacks from last meeting (Oct. 5th 2011)**
  - 8 communes rather than 7 are now convinced by the approach and results
  - Acceptable consens found in collaboration with SDT (cantonal representative)
  - Federal office for land planning (ARE) is very satisfied by the project
  - Communes ask for a follow-up
    - Feasability study asked