

# **KerDST: THE KERBABEL™ ON-LINE DELIBERATION SUPPORT TOOL**

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## **Key words:**

Deliberation, online tools, sustainable development, mobility, social choice.

## **Summary**

This paper aims to present the kerDST on-line deliberation support tools, which are the outcome of several years of development and experimentation at the C3ED. After introducing the tools and the way they are used, we will present an example of their application to a research project aiming to define sustainable solutions for urban mobility. From this example, we will draw some conclusions about the interest of using online tools for deliberation.

## **1. Social choice problem, deliberation and online tools**

Public policy implies identifying, evaluating and selecting options through a decision making process. Traditionally, democratic problem is considered as the possible aggregation of preferences and/or interests and not as the deliberation about its content. Condorcet (1785) first underlined the impossibility to obtain a collective preference from the aggregation of individual preferences. Then Arrow (1963) developed the idea that it is impossible to realise optimal collective choice starting from individual preferences. He considered that such an aggregation was the subject of impossibility, instability and was arbitrary. He concluded on the non-existence of satisfying aggregation's mechanisms.

Generated by Arrow's impossibility theorem, social choice theories study the possibility for a society to choose a social optimum under the conditions of respecting the diversity of individual preferences linked to possible "social states" and making a democratic choice. Dryzek & List (2002) propose to keep an endogenous approach for deliberation structuring as an answer to social choice problems. According to these authors, the deliberative approach is *informal* – confronting individuals with new facts or new perspectives for a given problem and to corroborate or invalidate existing beliefs and perspectives-, *argumentative* – attract individuals' attention on new arguments, clarifying controversies-, *reflexive* – making people to reveal their own preferences and share their knowledge – and *social* – in creating a situation of interaction in which individuals can speak and listen to each other, enabling everyone to know where they locate compared to the others. Deliberation can then be considered as an alternative answer to the impossibility theorem.

After this, the next question is why using on-line tools for deliberation? For about ten years now, the C3ED team has been working on experimental tools starting from the rationale that on-line tools carried real democratic hopes as they opened radical opportunities of an access for all to knowledge but also of conviviality, opening and exchanges between individuals (Guimarães Pereira & O'Connor, 1999;

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O'Connor, 2006). Perspectives for making socially more satisfying decisions were then conceivable as on-line tools enabled everyone to get necessary knowledge to make his/her judgement, to take into account all the points of views and, in the same time, to favour exchanges of points of views. Yet, it also seemed intuitively clear at this time that these tools could do the opposite. The first reason is that access to information seemed finally more difficult than presumed. On the one hand, a too broad information offer leads to a “non-information” situation as it is too difficult for users to make their own concise information from all the sources. On the other hand, a problem of data referencing make too many information sources invisible and inaccessible (syndrome of data cemetery). The second reason is that some uses are contrary to the democratic ideas, such as uses for individuals control or surveillance. These interrogations about the interest of on-line tools based the experimental research program carried out on the development and use of interactive tools for deliberation support, with the hope to show online tools’ real democratic potential of conviviality.

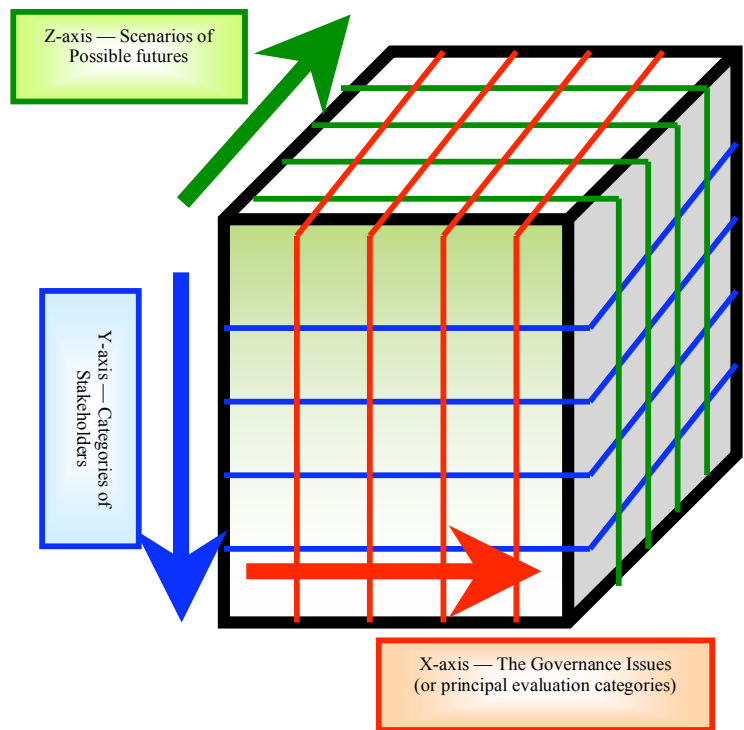
## 2. What is KerDST?

The **KERDST** is an on-line tool, developed with ‘Open Source’ conventions, offering to users a multi-stakeholder multi-criteria deliberation framework that can be applied to any situation of social choice or debate. It is composed of two main tools: the “KerBabel™ Deliberation Matrix” and The “KerBabel™ Indicator Kiosk” (KIK).

The task proposed is to specify three categories of information so as to ‘build your problem’, then proceeding to a qualitative multi-stakeholder multi-criteria evaluation. The three information categories that are constitutive of the **social choice problem** are:

- the available choices (referred to as the **SCENARIOS**),
- those engaged in the deliberation about what to do (the **ACTORS**)
- and the reasons and arguments entering into the discussion (the **ISSUES**).

The ‘crossing’ of these three dimensions leads to the three-dimensional structure of the **KerBabel™ Deliberation Matrix** as the combination of two conflict matrices.



The role of the **Deliberation Matrix** (henceforth **DM** for short) is to permit a transparent presentation of the process and outcomes of judgements offered by *each* category of stakeholders, for *each* of the scenarios, across a *spectrum* of governance or performance issues.

In this process, the range of options (along the Z-axis), of governance issues (X-axis) and of stakeholder categories (Y-axis) must be established. This can be done either on the basis of prior discussions and analyses, or by real-time deliberation amongst those participating in the assessment.

According to this schematic model, the evaluation activity proceeds through the step-by-step phase — which can be undertaken on an individual or a collective basis within a group — that consists of *colouring the cells of the 3-D Deliberation Matrix*. Once the **DM** structure is in place, or even as it is being developed, the actors in the SA process focus on each cell of the **DM**, with the purpose that *each* stakeholder class should offer a judgement (e.g., satisfactory, poor, intolerable, etc.) of *each* scenario in relation to *each* of the key governance or decision issues.

- One obtains in this way, *for each stakeholder* (or class of actors), a rectangular array of cells, being a layer of the Matrix, within which the successive rows represent the evaluations (issue by issue) furnished by the selected class of stakeholders for successive scenarios.
- And, looked at from another angle, one obtains, *for each scenario*, a rectangular array of cells, being a layer of the Matrix, within which the successive rows represent the evaluations (issue by issue) by each class of stakeholder, of a given scenario.
- And, in the third way of “cutting the cake”, one obtains *for each issue*, a rectangular array of cells, being a layer of the Matrix, within which the successive rows represent the evaluations (stakeholder by stakeholder) of each scenario, with reference to the selected issue.

Moving beyond this first-level framework, the current (2005-2007) phase of multimedia development of the on-line **KERDST** system integrates two major features within the basic multi-stakeholder multi-criteria comparative evaluation framework.

- The first is the **mobilisation of indicators** as a basis for the cell-by-cell judgements; these indicators are catalogued in a “KerBabel™ Indicator Kiosk” (KIK), which can be accessed through on-line interfaces with the Deliberation Matrix.
- The second is the accommodation of **multiple participants as members of the deliberation community**, each participant being associated with one of the stakeholder categories and contributing to the building up of composite judgements for the cells of the Deliberation Matrix corresponding to that particular stakeholder category.

By combination, we obtain the four types of exploitation of the **KERDST** system’s possibilities, as follows.

- **CLOSED/NO INDICATORS** — **The first and simplest exploitation of KERDST is to define an array of (1) actors, (2) performance issues and (3) options or situations to be evaluated, and then colour the cells of the resulting 3-D Matrix using a code such as [red = bad], [yellow = not so bad], [green = good], [white = no idea], [blue = don’t care or not applicable].**

**Notes:** The **KERDST** system proposes these judgement categories and colours as default options, but the user can modify both the categories and the colours if desired. It is possible to proceed with ‘colouring the cells’ and, at the same time, make use of a text box for adding an explanation or commentary of the judgement (colour) made for each cell of the Matrix.

- **CLOSED/WITH INDICATORS** — **The second type of exploitation of KERDST is to incorporate a descriptive basis as a motivation for the judgement (colour) proposed in each cell, through the selection of a ‘basket’ of indicators taken to characterise relevant attributes of the scenario/choice or activity/site/territory under scrutiny. In this case, the indicators themselves are managed in an on-line catalogue, the corresponding KIK.**

**Notes:** As a function of the process adopted and the functionalities of **KERDST** that are exploited, the person or

group undertaking the SA can either choose indicators from a pre-existing **KIK** catalogue or contribute their indicator suggestions into an evolving **KIK** catalogue. The judgement at the “cell” level in the Matrix is obtained as a “weighted amalgam” of the judgements assigned to each indicator within the “basket” (using a colour code analogous to that employed for the cells in the version **CLOSED/NO INDICATORS**). Therefore the colour (or composite) of each Matrix cell is a function of the relative weight and significance attributed to each indicator in the corresponding basket.<sup>2</sup>

- **OPEN/NO INDICATORS** — The third type of exploitation of kerDST is the introduction of a community of participants in the SA process. In this case, after the spectrum of stakeholder categories has been defined (or, in real time, as these categories are decided), each of the individual participants (who are ‘registered’ on-line as members of the deliberation community for the SA that is taking place) declares themselves as a member of one of the stakeholder categories. Then, each participant may contribute to the building up of composite judgements for the cells of the Matrix corresponding to that particular stakeholder category.

**Note:** The composite judgements are expressed as colours (or colour composites) in the Matrix cells. The “composition” of each cell is therefore a function of the judgements expressed individually by the participants as “voters”. As in the simple (non-participatory) use of the **DM** without indicators, it is possible to proceed with ‘colouring the cells’ while, at the same time, using a text box for adding an explanation by each participant of the judgement (colour) proposed for each cell of the Matrix. In this case, the accumulation of individual explanations constitutes a discursive database of this stakeholder category’s views for each option/issue.

- **OPEN/WITH INDICATORS** — The fourth type of exploitation of KERDST is to combine the participatory process with the use of indicators. The participation of a real community of participants is proposed in terms of the selection, by each participant within a stakeholder class, of a ‘basket’ of indicators that characterise relevant attributes of the scenario/choice or activity/site/territory under scrutiny.

**Note:** The doubly composite judgements are expressed as colours (or colour composites) of the Matrix cells, and the “composition” of each cell is therefore a complex function of the judgements expressed individually through the selection of indicator baskets by each participant within the stakeholder class.

### 3. An example of application: deliberating about sustainable mobility solutions

As we already said, KerDST can be applied to every social choice problem, from the simplest (what pet can we have at home?) to the most complex (how to manage natural resources?).<sup>3</sup> This paper will focus on one particular application: deliberation of sustainable mobility solutions.

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<sup>2</sup> It follows that there must be some sort of rule for the ‘aggregation’ or ‘amalgamation’ of the judgements of individual participants within the stakeholder class, and also some choice of convention for visualising the ‘amalgam’. The choices on these points are important both methodologically and for the user-friendliness and effectiveness of the DST.

<sup>3</sup> The kerDST system mobilising the Deliberation Matrix in tandem with the KerBabel™ Indicator Kiosk (KIK) is currently being deployed in a variety of integrated environmental assessment projects, including the EC funded projects ALARM (biodiversity risks), SPICOSA (integrated coastal zone management) and ECOST (fisheries and coastal resources in South countries). It is also being exploited, in the French territorial context, within several projects of the programme R2DS (Réseau de Recherche pour le Développement Soutenable) supported by the Conseil Régional Ile de France; notably FRAGILE (biodiversity as a challenge for business and territorial sustainability strategies), AGRIVISTAS-IDF (exploring perspectives for sustainable agriculture in the IDF peri-urban context) and PLANET (territorial ecology). Transfers of the concepts and tools are underway in cooperation with inter alia partners in New

## **2.1. PROJECT CONTEXT**

Mobility allows access to jobs, markets, education, health care and other essential services, which makes transport one key element for progress and maintaining a decent quality of life. However, there is increasing concern for environmental and health issues, particularly linked to air pollution and climate change, and concern for social justice (equitable access, fair costs distribution) that questions the individual use of cars. Public transport networks and new alternative transport solutions (e.g. car pooling) are of growing importance in local councils' planning policies. However, the diversity of issues (social, environmental, economic and politic) and actors (users, companies, deciders, etc.) linked to transport raises several questions for managing and planning mobility in the aim of sustainability; how networks' efficiency can be assessed? What are the most relevant indicators to represent the whole set of issues associated to mobility? How can somewhat unpopular solutions, such as bus corridors, be better understood and accepted by the actors? The study carried out between May and September 2007 by Fondaterra and the Centre of Ethics and Economics for Environment and Development, in partnership with the French transport company Veolia Transport, aimed to investigate responses to these questions<sup>4</sup>.

## **2.2. THE APPROACH UNDERTAKEN**

Our approach aimed to engage mobility project stakeholders in an assessment and deliberation process about the different options for this project. Different categories of actors, each with their own experience, can actually convey a broader view of mobility issues. They can make judgements and useful recommendations and even participate in the decision process. The objective is a better relevancy and adequacy of decisions. Furthermore, we proposed to set up a mediation process during which stakeholders try to identify their differences and find solutions.

We used an assessment method, called Integraal, which consists of six main steps and integrates KerDST tools:

- **STEP ONE** — Identify « Our Common Problem » (on what terrain(s), at what scale(s), for whom, with whom?)
- **STEP TWO** — Organise the Problem (in terms of ACTORS, OPTIONS and the Quality/Performance ISSUES (the Societal Values or Q/P Multiple Bottom Lines)
- **STEP THREE** — Identify and Mobilise TOOLS for Representation (e.g., indicators, maps, models of processes and systems)
- **STEP FOUR** — Mobilise Actors for TASKS of deliberation about ACTIONS to undertake... Multi-Actor Multi-Criteria Evaluations
- **STEP FIVE** — Actions of Preparation, Discussion/Validation & Communication of Results & Recommendations
- **STEP SIX** — ... Return to STEP ONE...

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Zealand (AgResearch, Landcare) and West Africa (UCAD, IRD, Bilan Prospective ICZM) Many of the developed examples can freely be consulted on the internet website: <http://kerdst.c3ed.uvsq.fr/>.

<sup>4</sup> For more information on this project, see Chamaret, Povillon et al. (2008)

### **2.3. EXPERIMENTS IN PARTNERSHIP WITH THE CITY OF ACHÈRES (YVELINES)**

Achères is a commune in the northwestern suburbs of Paris of about 20 000 inhabitants. Municipal authorities are involved in environmental issues and public transport efficiency is one of their concerns. Two case studies were undertaken.

The first case study was an investigation into improving the services of an intercity bus line which suffered from decreasing use. Through interviews in the field and literature review we defined:

1. **the stakeholders** : (1) users, (2) coordinating authorities, (3) economic actors and (4) transport companies
2. **the performance issues** : (1) Does the existing system provide for mobility needs?, (2) Does it preserve environment?, (3) Does it preserve health?, (4) Does it contribute to economic and social development?, (5) Is it comfortable and convivial?, (6) Does it allow equitable access to transport? and (7) Is it economically viable?
3. **and the options** : (1) cancelled service, (2) division, (3) business as usual and (4) new path.

According to what we were told during the stakeholder interviews, we filled the Deliberation Matrix using indicators. The figure below shows the summary results for the four options. We can see that the “greenest” option is the “new path”, whereas the “reddest” one is the “cancelled service”. These results echoed those of earlier investigations by the transport company and the local authorities, but no decision had yet been taken.

The second case study aimed to optimise the access to a future activity area called “La Petite Arche” which the local authorities hoped would become an example of environmental and sustainable excellence. Therefore they favoured “soft modes” (green transport) means of access, especially by bike, pedestrian and public transport, though they were unsure of the best way to achieve this. Three categories of stakeholders were included in the study (authorities thought it was too early to involve users): local authorities, planners and transport companies. Meetings were organised from which three planning

options involving infrastructure changes were identified. From this, and in the same way as for the first case study, stakeholders were asked to evaluate the three identified options against the performance issues (same ones as in the former case study). Fortunately, because the infrastructure is still under construction, there is an opportunity for the authority to incorporate the appropriate option into the construction schedule.

#### **2.4. MAIN RESULTS ISSUED FROM THE EXPERIMENTAL APPLICATION OF THE DELIBERATION MATRIX**

The Deliberation Matrix can be characterized by four development's choices that determine its conditions of use and relevancy. First, there is the wish to keep *a real simplicity* of the tool, be it in the display (colours) or in the algorithm, that makes it understandable by most people, contrary to other more traditional multi-criteria analysis. Then, being *on-line* guarantees broader uses than a simple local use. Its capacity to *keep information* (users' profiles, projects, etc.) and to make them accessible to all participants is another key factor. At last, its *multi-actor character* offers the possibility to several participants to work together, on the same project, at the same time.

These comments made, several remarks can now be drawn from the case study concerning the interest of the Deliberation Matrix as an online deliberation support tool.

First it represents an *information and knowledge support* giving access to participants to a set of structured data on the problem under study. Each actor can find answers to questions such as: which scenario(s) seems the more acceptable? Which actors' group presents the most marginal points of views? Which issues are the most disputed? Anyone can choose its information level: from the most detailed (judgments of each actor on each issue for each scenario) to the most simple (synthesized data are offered for each axis' elements).

Thanks to this information availability, the Matrix initiates a process of transparent exchange, each participant having access to the points of view posted by the others. The tool then becomes the *discussion support*. This exchange is a non trivial answer to social choice problems that necessitate negotiation processes between actors. This aspect is reinforced by the game "greening the Matrix" that consists, through dialogue, of transforming negative judgments into positive judgments. This symbolization makes more tangible the game that is occurring between the participants and gives them a more explicit and more easily reachable target.

The Deliberation Matrix can, at last, become a *communication support* that is efficient and easy to use. Several "clicks" are enough to show to participants (and to non participants) what one should retain from the process or to analyse results from one particular option.

#### **Concluding remarks**

The constructive role of the **Deliberation Matrix** is thus to demonstrate and make accessible, *in a stylised way*, a full range of stakeholder perspectives with regard to the effects that an existing activity, or a proposed technological, economic or governance policy (etc.), may have. The **DM** with its associated **KIK** provides a framework allowing us to make the transformation from a plethora of "weak signals" to a structured array of strongly focussed judgements. The experimental applications of the Deliberation matrix have shown several signs in favour of the tool's conviviality's potential to answer the social choice problems. If we are conscious of the tool's imperfections (notably in terms of display) that represent for us unlimited improvement tracks, these case studies yet represent concept proofs that online tools can be non trivial means in favour of democracy.

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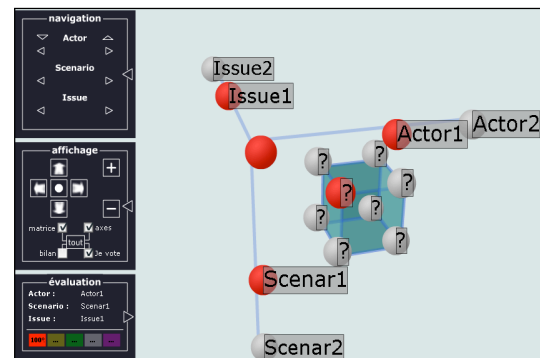
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## Appendix: Using KerDST

In the following paragraphs, we present some of the key steps for an on-line user of the **KERDST** system. Our purpose is not to give a complete guide to the user, rather to provide a glimpse of how things look in practice, the evaluation process and outcomes being built up progressively and deliberatively, through several layers of declarations, choices and judgements.

**The screen-copy on the right gives a simple illustration of the structure of the Deliberation Matrix on-line. This is a 2x2x2 array; there are two scenarios; there are two actors (or stakeholder categories); and there are two performance issues.**

**The 3 axes and their values are visible, as well as the individual cells, each of which must be attributed a judgement. When a cell is grey, it means that no judgement has yet been attributed for that scenario on that issue by the actor concerned.**



Within this general framework there may be, as a function of the conventions of deliberation adopted, various "lower" layers of deliberation, which may include the following:

- In the case of an indicator-based assessment: (1) there is the selection, from amongst the range of "candidate indicators" available or invented, of a small number (not more than five) indicators for each basket; this selection is associated with (2) the interpretation (significance) to be attributed to each indicator in a basket; and decisions about (3) the relative or absolute importance (weight) of

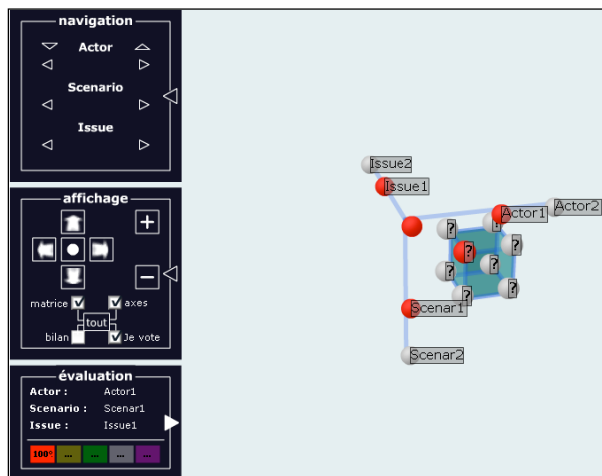


each indicator in relation to the others in the basket, for arriving at a synthetic judgement for the cell as a whole.

- In the case of a multi-actor participative assessment: (1) there arises the question “who participates” as “representative(s)” of each stakeholder category; and (2) there is the question of the relative importance of participants within each stakeholder group in the building up of the “composite” judgement (with or without indicators) of the stakeholder class for each cell.

Although **KERDST** offers four main variants, for simplicity we will present only the version of a non-participatory evaluation supported by indicators, *viz.*, the variation C, labelled **CLOSED/WITH INDICATORS**. The key feature of this variation is to incorporate a descriptive basis as a motivation for the judgement (colour) proposed in each cell, through the selection of a ‘basket’ of indicators taken to characterise relevant attributes of the scenario/choice or activity/site/territory under scrutiny. We show, with the screen-copy images below, the on-line interface for selecting indicators deemed relevant for the scenario-issue in question, and attributing a sense and relative im

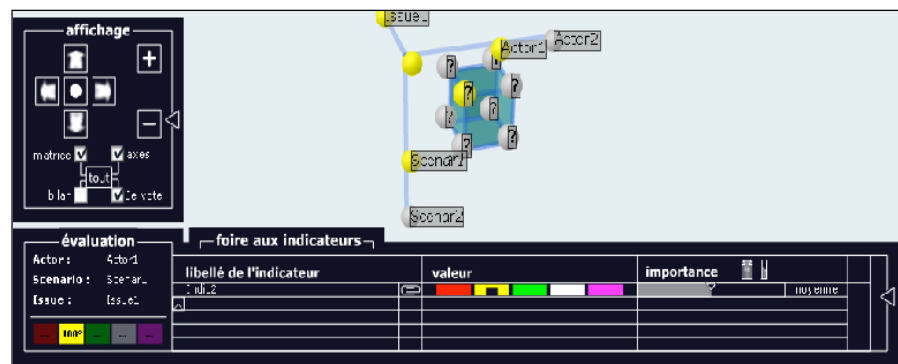
portance to them. In order to adopt the convention that the deliberation will exploit indicators, the user must click the option « **MATRIX WITH SMALL INDICATORS DIALOGUE BOX** » in the menu for setting up the deliberation.



Once the deliberation process is activated, question marks appear on all the cells. Clicking on any cell then allows the user (or the respective “actor”) to express their view of a scenario as a function of each performance issue. In our example below, **ACTOR 1** is engaged in making a judgement on **SCENARIO 1** with reference to performance **ISSUE 1**. The judgement at the “cell” level in the Matrix is obtained not by a simple choice of colour for the cell, but as a “weighted amalgam” of the qualitative judgements assigned to each indicator within the “basket” (using a colour code *e.g.*, *red=bad*, *green=good*).

Therefore the colour (or composite) of each Matrix cell is a function of the relative weight and significance attributed to each indicator in the corresponding basket.

With the option of an **Indicator Kiosk (KIK)** linked to the Deliberation Matrix, the user has the possibility to select a “basket” of indicators relating to any one cell (*viz.*, the judgement that an actor gives about one scenario regarding one issue). The indicators themselves must be managed in some sort of catalogue. In the **KERDST** system, as a function of the sustainability assessment process adopted and the functionalities of the on-line tools that are exploited, the person or group undertaking the SA can



either choose indicators from a pre-existing catalogue or contribute their indicator suggestions into an evolving **KIK** catalogue.

Within the catalogue as it appears to the user on line, there appear columns for the *name* of the indicator, its *significance* (expressed in form of the selected *colour code*), and its *relative weight* in the final result of the cell.

Working on-screen, there are two ways to specify the *weights* (that is, relative importance) of the different indicators that contribute, in the “basket”, to the overall cell judgement. One way is to propose a weight expressed in absolute figures for each of the indicators; the alternative way is to specify a weight expressed in relative (percentage) figures. As an example, with the specification of absolute weights, one might choose figures between 0 and 100. Suppose that the figure of 50 is specified for two indicators, and then 100 for a third one. Expressed as relative (percentage) weights, these figures are normalised into 25%, 25% and 50% respectively, summing to 100%.

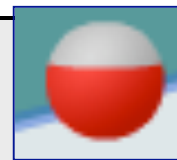
The result of the process of indicator mobilisation for one cell, is visible on-screen in an array that shows the percentages for every colour “summed up” across the indicators in the “basket”. Given that each indicator is individually attributed a qualitative significance (via its colour code), it follows that there must be some sort of rule for the ‘aggregation’ or ‘amalgamation’ of the indicator ‘signals’, and also some choice of convention for visualising the ‘amalgam’.

Cell by cell, as the deliberation process is pursued, the Deliberation Matrix becomes more and more colourful, each cell’s colour profile being generated by the indicator basket composed for it. An overall impression of the choice problem is then obtained by appraising the patterns of colour differences — from scenario to scenario, from actor to actor, from issue to issue.

Numerous conventions might be adopted, and here we mention the current ‘default’ convention offered within the existing **KERDST**. This default convention is that the cell itself takes the colour that has the highest percentage in the “basket of indicators”.

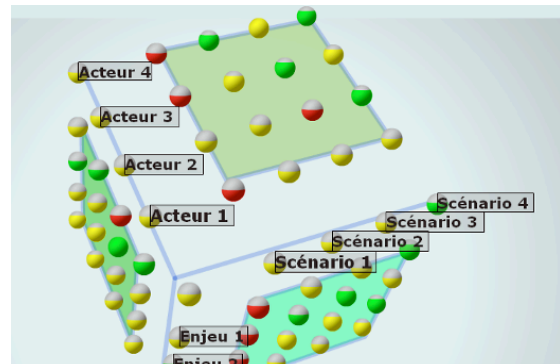
Consider, for example, a basket composed of four indicators as follows:

- Green [*GOOD*] for an indicator that is attributed 50% importance
- Yellow [*FAIR*] for an indicator that is attributed 10% importance
- Red [*BAD*] for an indicator that is attributed 30% importance
- Red [*BAD*] for an indicator that is attributed 25% importance



The weight given to “red” is 55%, which is the highest single colour, and so this is the “predominant” judgement. The cell will be displayed in the Matrix with a colour pattern of 55% red, as shown.

There are many facets to the impressionistic “reading” of the Deliberation Matrix” once filled in. One method of appraisal is specifically provided for by the on-screen visualisation, through the portrayal of arrays of “*EXTERIOR*” *CELLS* that “amalgamate” the results (in the format of colour composites) of the respective Matrix rows, or of entire Matrix slices. For example, by



regarding these synthetic “amalgam” cells associated with successive scenarios, a “fuzzy” signal is obtained as to the degree of acceptability of each scenario for all actors across the spectrum of issues.

In the figure on the right we show a screen-copy example of these “*EXTERNAL CELLS*” (with the inner Matrix suppressed). These “amalgam” or “external cell” colour composites are obtained through application of composition conventions based on the underlying judgements with indicators (and thus, methodologically coherent with those mentioned above for the passage from an indicator basket to a Matrix cell). Clearly therefore, as “composite” signals in this sense these “amalgams” do not and cannot convey every aspect of the underlying information. (For example, a “half-red” cell, at whatever level of composition, does not necessarily convey a judgement that is definitively worse than a “half-green” cell.) For a meticulous interpretation it is always necessary to look back into the individual’s or individuals’ statements at the lower levels.

