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**OECD**  
**Pesticide aquatic risk indicator  
project**  
**French contribution**  
**Technical summary report**

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This work was carried out from April to October 2002, it finalizes the French contribution to OECD project on pesticide aquatic risk indicators. The general purposes of the study are described in the report of the OECD project on pesticide aquatic risk indicators.

Work was done in three steps:

1. modification of several parameters in the software to integrate last version of SYSCOR indicator,
2. gathering and selection of contamination data and use data in order to run the three OECD indicators,
3. analysis of the results provided by indicators, comparison with contamination data, analysis of the response of the indicators to various scenarios.

The most significant results are reported here. The full report is available in French language to the ministry of ecology and sustainable development.

### **A. - Modifications made to the Risk indicator software**

The first part of the work consisted of updating the SYSCOR part of the software by introducing modifications proposed by experts of the national working group "indicator validation".

### **1. Koc value (class 5)**

When experimental log Koc is available, it is used. If not, an estimation is made from log Kow using the following formula:

$$\text{logKoc} = (0,47 \times \text{log Kow}) + 1,09$$

If neither Koc or Kow is available, the default value 0 is used.

The breakpoints for the categories o, m, d (see description of SYSCOR method in the OECD documents ) are the same for Log Koc and the estimation carried out with Log Kow.

### **2. Application method (class 2)**

Spray is credited with the unfavourable situation, increasing to four the number of unfavourable application methods. If a buffer zone higher or equal to 6 meters is respected, then these unfavourable application methods pass to the “m” level.

### **3. Cumulated area treated (class 1)**

Ranking of the pesticides (table "Access\_%\_all CAT" in the software) is done in ascending order of the values of cumulated area treated for each use, by year and region.

The percentage of cumulated area treated (%cat) is calculated for each pesticide.

### **4. A second index**

A new index is proposed in supplement with that already existing in the later version (exposure/direct value of toxicity). This new index is calculated by multiplying exposure by the co-logarithm of toxicity.

The Access request “Class\_tox” gives for each pesticide the direct value and the Co-logarithm of toxicity for algae, daphnids and fish.

The new index is presented in the Access results table “Ris SYCOR” named:

- SASA2: SIRIS Acute Scaled Algae 2: index of short-term risk on algae,
- SASD2: SIRIS Acute Scaled Daphnia 2: index of short-term risk on daphnids,
- SASF2: SIRIS Acute Scaled Fish 2: index of short-term risk on fish.

An updated version of the software developed by the working group OECD should be available on the RRSR web page in December 2002.

## **B. Data sets**

### **1. Regional data**

The regional data come from surveys carried out in the small region of Auradé (South of France) over four consecutive years. These data relate to the Environnement characteristics, the use of pesticides, and the water contamination data.

### **2. National data**

It was planned to work with reliable national data, after consultation of experts from the Regional services of Plant Protection. The requested information relates to the applications of active substances on crops: amounts of the substances brought to fight against the various parasites and frequency of application. These data are used to evaluate the area concerned and the average amounts by culture for each active substance.

The experts encountered many difficulties to estimate treated area and application number for each parasite and for each crop. Data thus collected could not be used because of the poor feedback of the survey. A more empirical approach was thus considered. An estimation of treated area for each substance is made from average application rates and amount of sold substances (Industry data). These national data are available for three years, from 1999 to 2001.

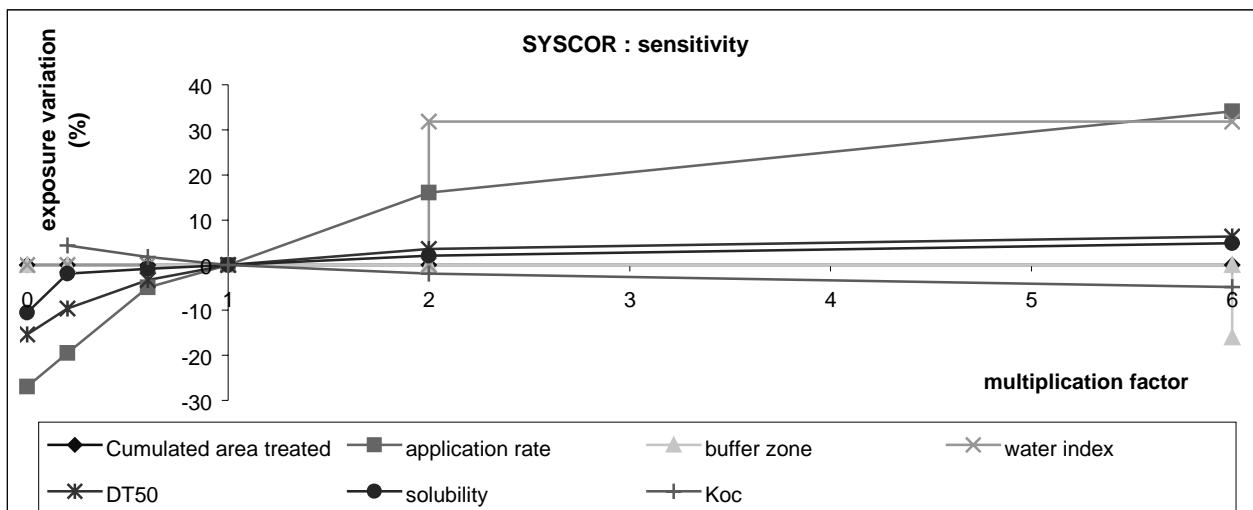
It should be significant to note that this method is far from precise. Calculations of the average dose rate and cumulated area treated is made on the basis of formal registrations data and do not consider the real uses of the substances: the error can be high.

## **C. Sensitivity Analysis of SYSCOR indicator:**

The sensitivity analysis allows to evaluate the contribution of the input variables in the calculation of the outputs of the indicators. The method used is described in the Swiss technical report.

The used data come from Auradé.

Each variable considered is successively multiplied by six coefficients: 0; 0.2; 0.6; 1; 2; 6. The deviation percentage of the exposure value was calculated for each coefficient on each variable.



**Fig 1 : Sensitivity analysis of SYSCOR**

The sensitivity analysis of SYSCOR shows that the weight of variables in the exposure calculation is coherent with the construction of SYSCOR (fig 1). Nevertheless this analysis highlighted one of the limits of the indicator:

SYSCOR is not sensitive to the variation of cumulated treated area if this variation is the same for all the pesticides. Thus a multiplication of the number of treatments (for example if all the treatments were done twice) would not vary the exposure and would have no impact on the calculated risk index.

### **D. Correlation tests “ exposure / contamination”**

Linear correlations between the exposure values calculated by the indicators and the measured values of contamination were carried out on four years with each indicator. The contamination was represented by maximum concentration, frequency of quantification and average concentration. The linear regressions obtained over the various years are not significant, the correlation coefficients found are low, often lower than 0.25.

## E. Evolution of the risk index calculated by the indicators over four years

### 1. Regional level

A representation of REXTOX, ADSCOR and SYSCOR and two simple indicators was carried out (fig2). The simple indicators used are the quantity of active substance ( $\Sigma$  quantity) and the ratio between the quantity and the lowest toxicity data available ( $\Sigma$  (quantity/ lowest toxicity value)) called "number of toxic doses". Variation of SYSCOR is low compared to the other indicators. Nevertheless REXTOX and SYSCOR show the same trends: an increase of the risk in 1998 followed by a decrease in 1999 and 2000.

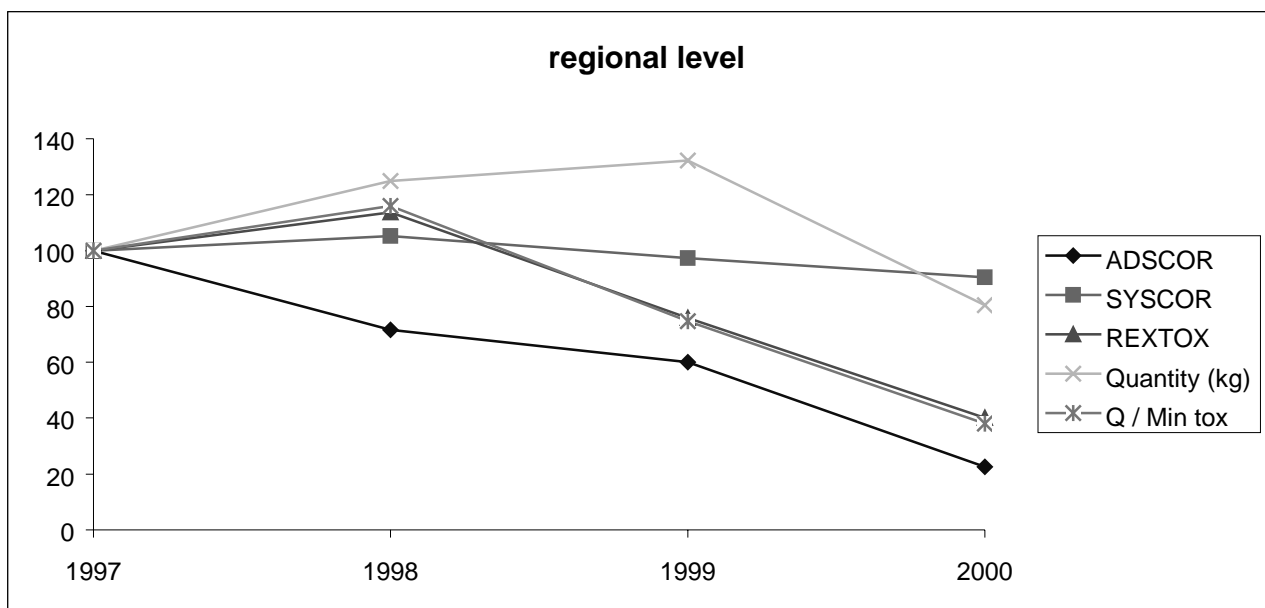


fig2 : Auradé region

ADSCOR index decreases for the four consecutive years. The simple indicator "quantity" increases from 1997 to 1999 then decreases in 2000 whereas simple indicator "number of toxic doses" decreases from 1998. REXTOX and "number of toxic doses" show very comparable results. The three OECD indicators and simple indicator "number of toxic doses" show a reduction in the risks from 1997 to 2000 in Auradé area. This result is coherent with the work carried out for ten years on this pilot area where recommendations on pesticide uses have been made.

## 2. National level

With national data over three years, REXTOX gives the same results as "number of toxic doses" by showing two decreases, ADSCOR is quite similar, and SYSCOR is decreasing only during the third year (fig 3). But these results must be taken with precaution, due to the calculation method of the national data (see B 2).

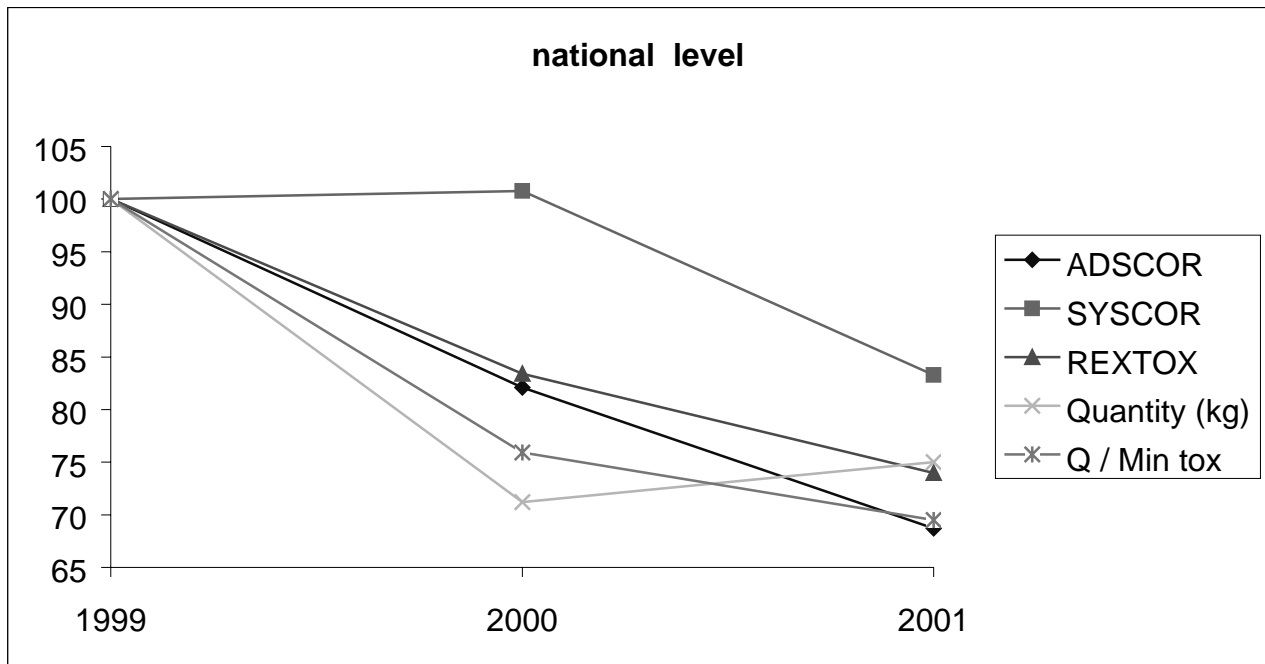


fig3 : national level

## F. Response of the three OECD indicators to scenarios

Another approach to test indicator SYSCOR consists in studying its reactions to various scenarios and comparing them with the reactions of ADSCOR and REXTOX.

The five scenarios are as follows:

- scenario 0: "reality", it consists in the real data of the Auradé region (except buffer zones)
- scenario 1: division of all the herbicide treatments (half application dose rate applied twice)
- scenario 2: substitution of the trifluraline (herbicide for the sunflower and colza) by aclonifen
- scenario 3: installation of 8 meters buffer zones on all crops and for all the substances
- scenario 4: reduction of 20 % of the amounts of herbicide applied.

The results are presented in graphs (fig 4, 5, 6 and 7) representing the total risk index of the three OECD indicators and of the "numbers toxic doses" indicator for the various scenarios

### 1. SYSCOR

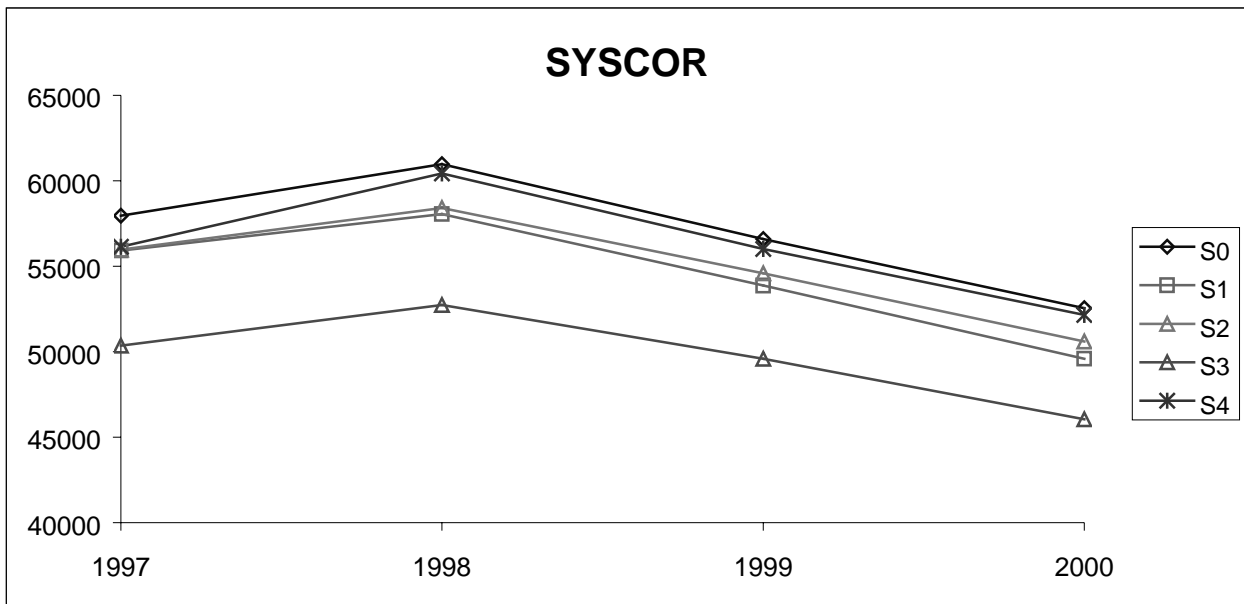


Fig 4 : Response of SYSCOR indicator to scenarios.

### 2. ADSCOR

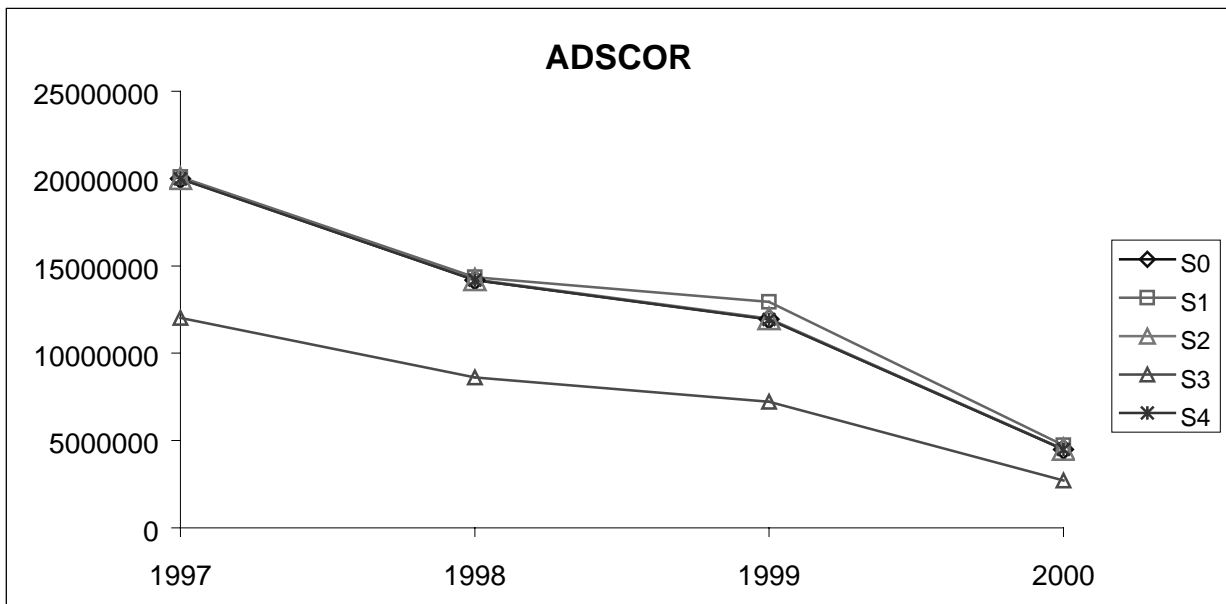


Fig 5 : Response of ADSCOR indicator to scenarios.

### 3. REXTOX

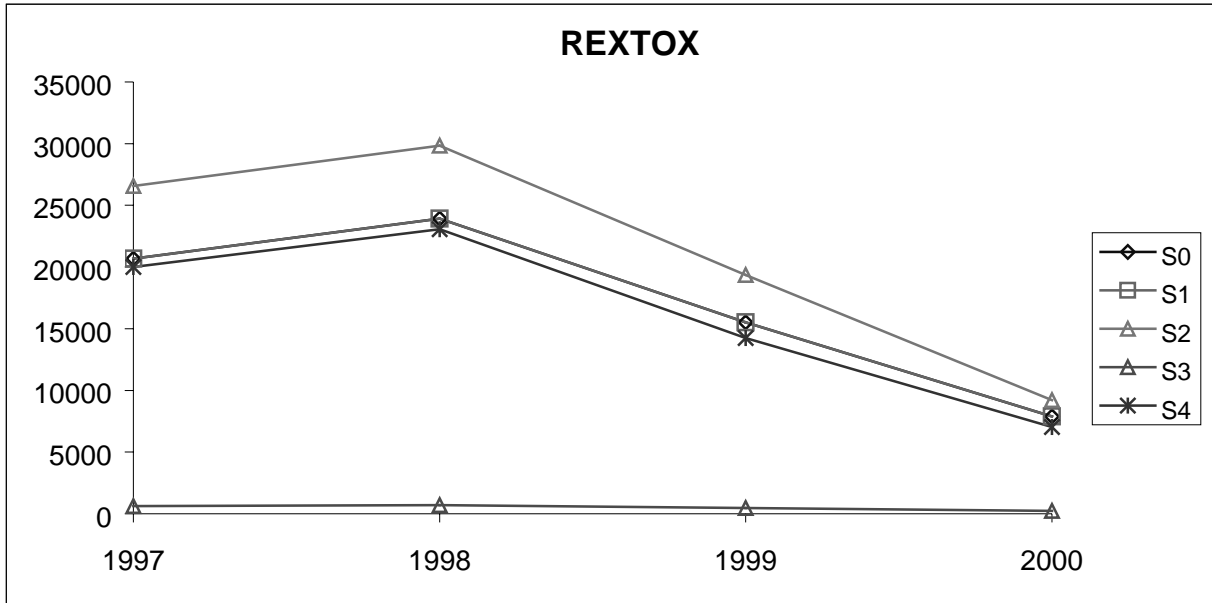


Fig 6 : Response of REXTOX indicator to scenarios.

### 4. Simple indicator « number of toxic doses »

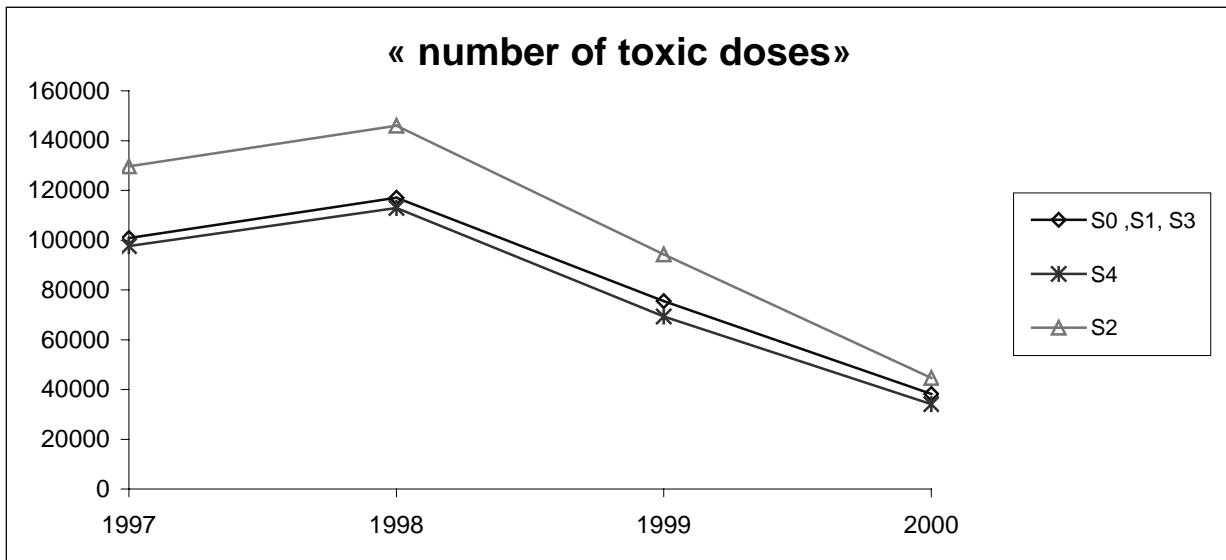


Fig 7 : Response of indicator « number of toxic doses » to scenarios.

## 5. Summary of the responses of OECD indicators to scenarios

Scenario 1: division of the treatment (half dose applied twice) is a practice known to reduce the risks of pesticides leaching towards surface water. Only SYSCOR shows this risk reduction, whereas ADSCOR gives a contrary result. REXTOX is insensitive to this scenario.

Scenario 2: SYSCOR and REXTOX react in an opposed way, ADSCOR is insensitive.

Scenario 3: OECD indicators show the most significant risk reduction when buffer zones are installed. Simple indicator "number of toxic doses" is not sensitive to this scenario.

Scenario 4: SYSCOR and REXTOX show a reduction in global index. On the other hand ADSCOR does not seem sensitive to a reduction of 20 % of the amount of herbicide applied.

The indicators showing the most sensitivity to these scenarios are SYSCOR and REXTOX. ADSCOR is less sensitive to this test.

## **G. Conclusions**

The simulations carried out on the three indicators showed that:

- it is excessive to expect from these three indicators a linear correlation between the calculated exposure values and the contamination data for surface water,
- with the data used, REXTOX and ADSCOR behave like simple indicators (quantity, surface area),
- gathering appropriate data is difficult, thus use of these indicators is also difficult.

The French working group estimates that:

- work already done on these indicators is sufficient,
- in spite of a certain sensitivity and convergence, these indicators do not fully satisfy the starting objective of the OECD project,
- future work on indicators should be based on simpler indicators, more easily understandable and usable.