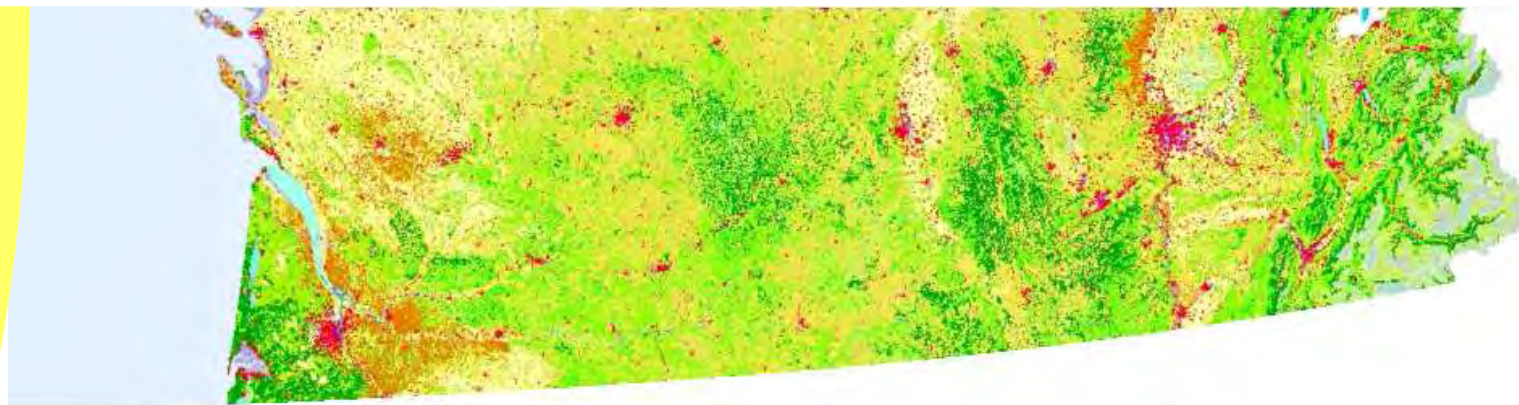


Conseil  
économique pour  
le développement  
durable

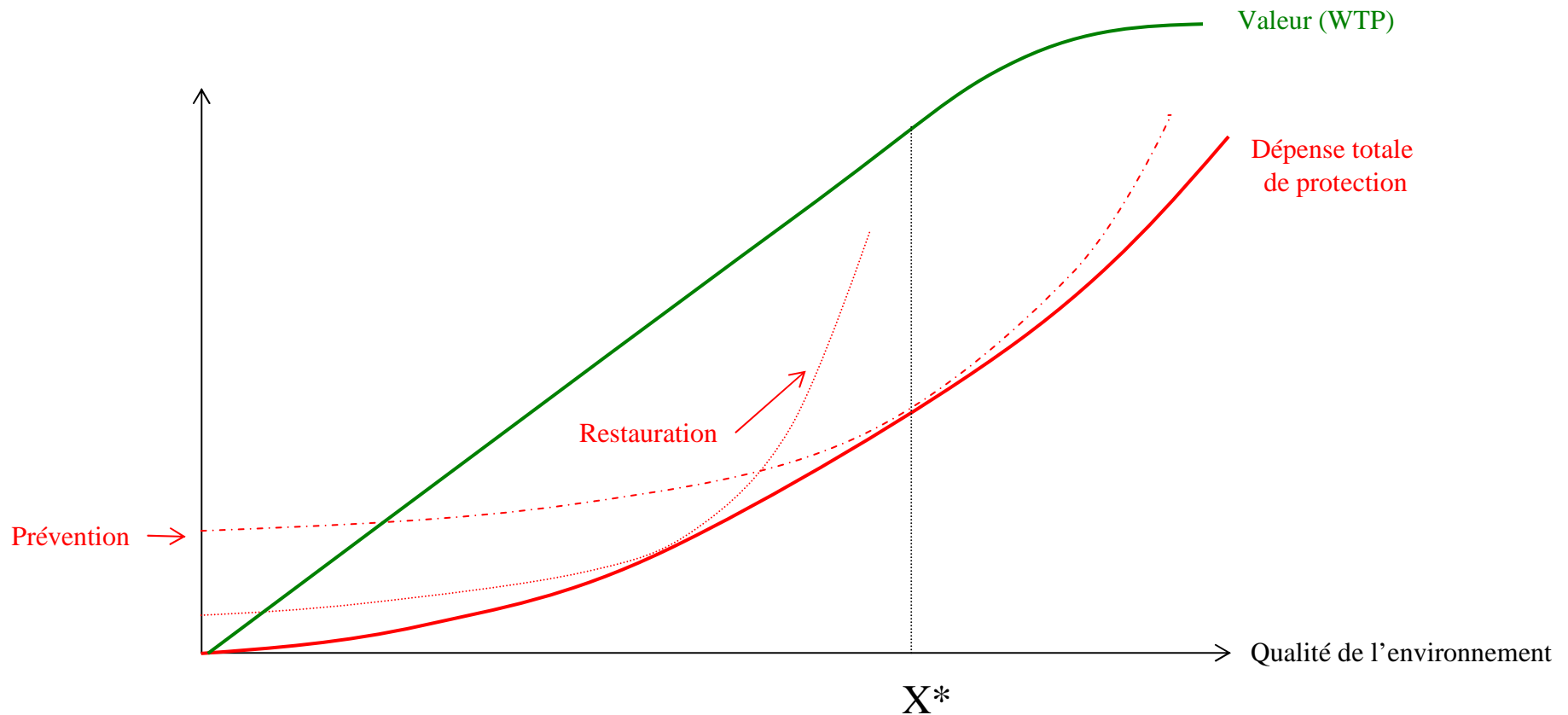


## Mesurer la croissance verte Comptes et ACB

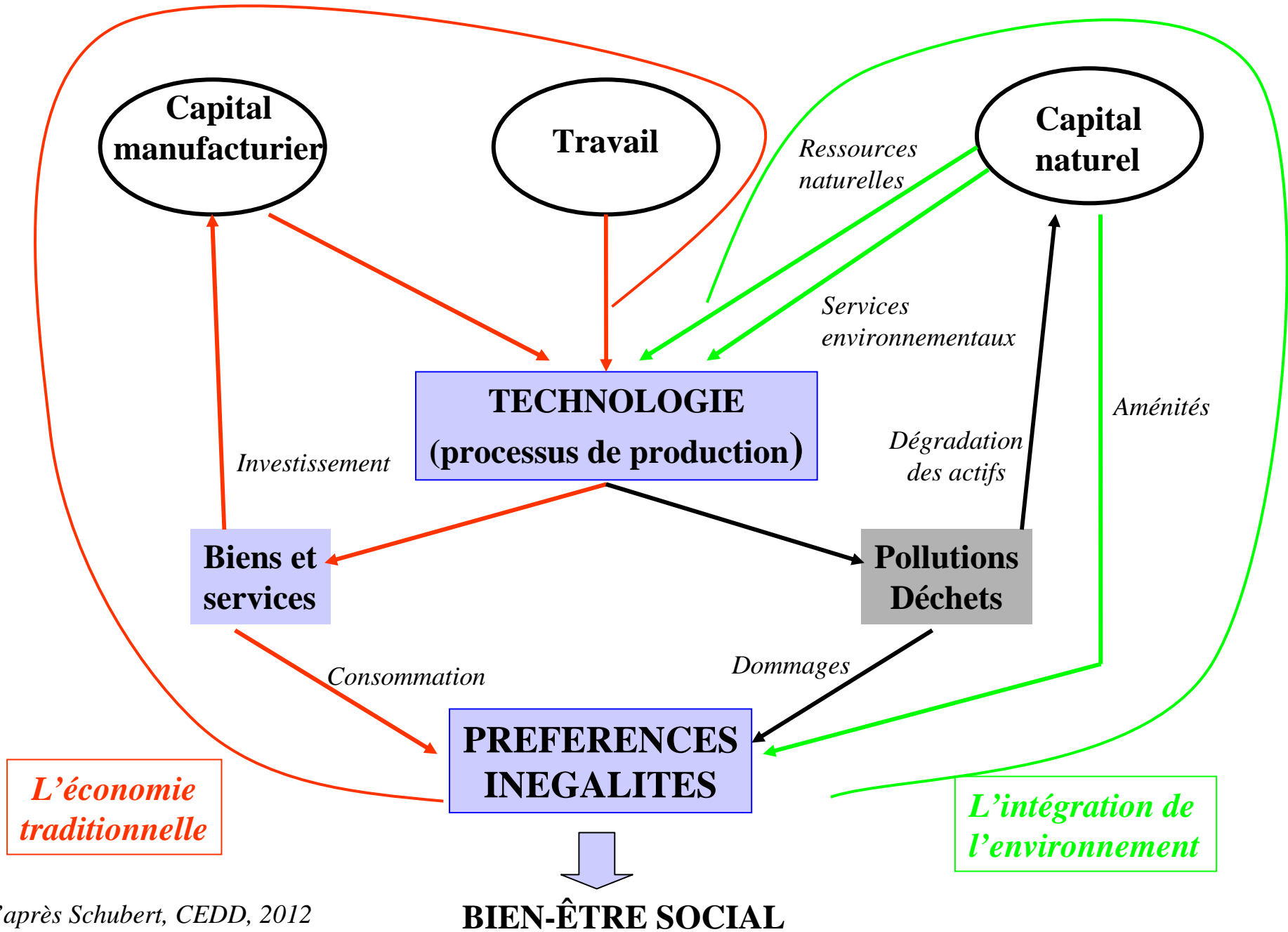
Dominique Bureau



# Insuffisances d'une seule mesure des dépenses de protection



$$W \neq WTP - D_{\text{prévention}} - D_{\text{restauration}}$$



D'après Schubert, CEDD, 2012

# CBA Principles

## ➤ Classical hypotheses :

- competitive markets
- optimized transfers

## ➤ Notations :

$x_{il}$  consumption of good  $l$  by household  $i$

$w_1$  resource in good  $l$ , price  $p_1$

$u_i, u_i^*$  utility functions of household  $i$

$W$  social welfare fonction

## Consequences

$$dW = \sum_i \sum_l (\partial W / \partial u_i) \cdot (\partial u_i / \partial x_{il}) \cdot dx_{il}$$

$$\# \sum_i \sum_l p_l \cdot dx_{il} = \sum_l p_l (\sum_i dx_{il})$$

$$= \sum p_l dw_l$$

## Implications

- $\forall l, \sum_i x_{il} = w_l$
- same  $(\partial W / \partial u_i) / (\partial u_i^* / \partial R_i)$  for every  $i$
- $\forall i, l \quad (\partial u_i / \partial x_{il}) = p_l \cdot (\partial u_i^* / \partial R_i)$

## Interpretations of $dW = \sum p_l \cdot dw_l$

- Macro : GDP variations at constant prices as estimates of Welfare changes
- Micro : Hicks-Kaldor compensation criteria (CBA)

## **Limits at CBA for the Environment**

### **Situation in the Seventies**

- **Lack of recognition of environmental challenges**
- **Lack of data**
- **Need of general equilibrium approaches**
- **How to estimate monetary values for non-market goods?**

## Need of WTP estimates

- **Limites des coûts d'évitement (optimalité ; aversion au risque)**
- **Développement de deux types de méthodes :**
  - **fondée sur l'observation de marchés adjacents**
    - > **prix hédoniques (Rosen)**
  - **sur l'économie expérimentale**
    - > **évaluations contingentes**

## Fields for applications (French studies)

- Eco-systèmes
- Eau et zones humides
- Forêts
- Sites remarquables
- Nuisances des transports
- Nuisances liées à la production d'énergie
- Pollution atmosphérique
- Déchets
- Risques

## Valuation of ecosystem services : the case of wetlands

Figure 1 - Valeurs à l'hectare des services rendus par les zones humides du PNR des marais du Cotentin et du Bessin (en euros)\*

Services	Min.	Max.
<b>Services de régulation</b>		
• Recharge des aquifères et soutien d'étiage	190	370
• Purification de l'eau	830	890
• Régulation du climat	1 800	1 800
<b>Services de production</b>		
• Agriculture	585	750
• Conchyliculture	120	120
<b>Services culturels</b>		
• Chasse	170	340
• Pêche amateur	165	230
• Valeur éducative et scientifique	10	15
• Valeur esthétique et récréative	290	1 170
• Appartenance au site	Non évaluée	Non évaluée
• Biodiversité (non-usage)	225	870
<b>Valeur économique totale</b>	<b>2 400</b>	<b>4 400</b>

Source : CGDD

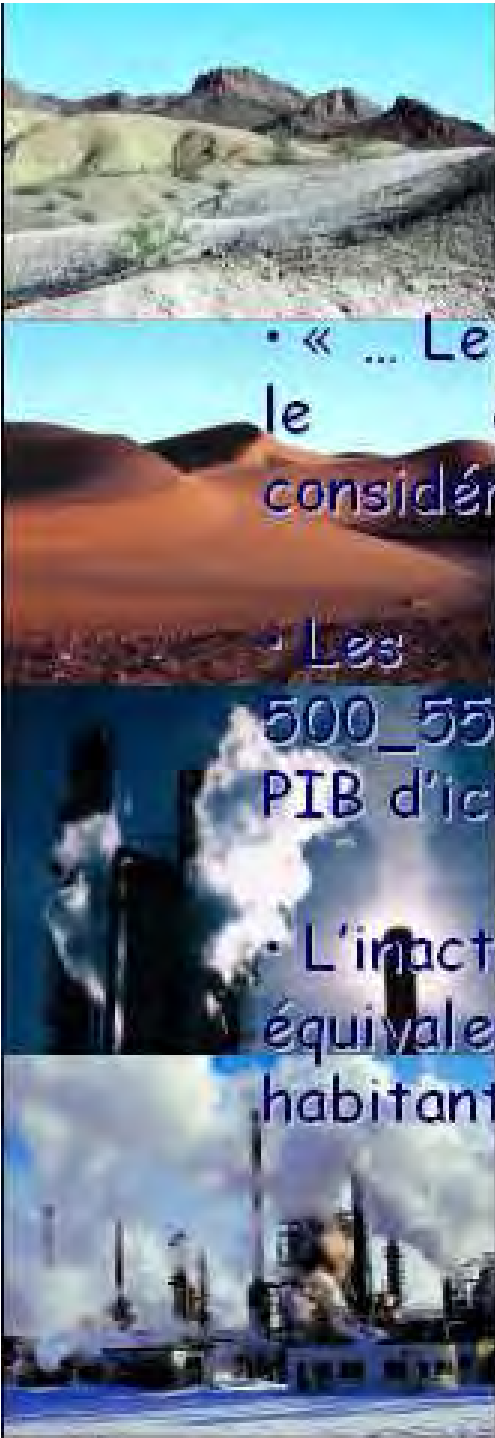
\* La Valeur Économique Totale à l'hectare est obtenue par simple division de la Valeur Économique Totale par le nombre d'hectares de zones humides du site. Elle n'est donc pas égale à la somme des valeurs individuelles à l'hectare des différents services, ces derniers étant inégalement assurés selon les surfaces considérées.



## Factors of rapid growth of such studies (in France and abroad)

- Reconnaissance des externalités négatives des transports, de l'énergie, des transports, de l'agriculture...
- Controverses autour du renforcement des normes d'émissions ou de rejets
- Diversification des instruments d'intervention (taxes, permis)
- Procès des catastrophes écologiques (réparation)
- Disponibilité de méthodes adaptées, sous réserve :
  - de faisabilité (données), des conditions de mise en oeuvre
  - de leur utilisation dans leur strict domaine de pertinence (CAP)
  - des extensions nécessaires (pb de « l'irrationalité », des comportements : risque, long-terme, altruisme...)

# Le rapport Stern



- « ... Les bénéfices d'une action forte et rapide sur le changement climatique dépassent considérablement ses coûts... »

- Les coûts annuels d'une stabilisation à 500\_550ppm éq. CO<sub>2</sub> se situeront à environ 1% du PIB d'ici 2050

- L'inaction (BAU) réduira le bien être d'un montant équivalent à une réduction de la consommation par habitant allant de 5% à 20%



## Critère(s) communs : espérance d'utilité actualisée

- $W = \sum_t e^{-\delta t} E(u(c_t))$ , individu représentatif, vivant indéfiniment

- ou  $W = \sum_t e^{-\delta t} N_t E(u(c_t))$  critère utilitariste, préférences identiques, distribution optimale des revenus en  $t$

- Stern :  $W = \sum_i \sum_t e^{-\delta t} N_{it} E(u(c_{it}))$

- Avec  $\delta = 0,1$  soit  $W \approx \sum_t E(u(c_t))$

... mais n'empêche pas une exigence de retour sur investissement (car  $u$  concave ...)

# About controversies: two main topics

- **On principles:** money values, CBA agregation... simplistic?, non ethical?...perhaps, but do not underestimate risks of capture by private interests with other methods (multicriteria)
- **On uncertainty:** important point, but choices must be made under uncertainty...>does not discredit CBA

But need for relevant CBA estimates: replacing uncertain outcomes by their expected (mean) value is generally not justified

[And some misunderstanding: the optimisation process allowed by CBA is often more important than the comparison between rate of return estimates and strict thresholds]

## Key shadow prices

- **Externalités ; temps long ; incertitudes**
- **Références pour l'action publique (valeurs tutélaires)**
  - Boiteux (pollutions liées au transport)
  - Quinet (CO<sub>2</sub>)
  - Chevassus-au-Louis (biodiversité)
  - Lebegue (taux d'actualisation dégressif)
  - Gollier (risque) :  $rr = a + \text{bêta} * \text{delta}$
- **Intégrant (éventuellement) certains développements ou questionnements récents (rationalité limitée; « puzzles »)**

# Conclusion

- Remarkable developments to incorporate environmental values in CBA
- Estimates less precise than we would like...
- But not bad at all to optimize public interventions
- Governance of expertise is critical



# Recommendations and one year implementation of Stiglitz Sen Report

## *Sustainable development and environment*

### Recommendations

**R11:** Sustainability assessment requires a well-identified dashboard of indicators. The distinctive feature of the components of this dashboard should be that they are interpretable as variations of some underlying 'stocks'. A monetary index of sustainability has its place in such a dashboard but, under the current state of the art, it should remain essentially focused on economic aspects of sustainability.

**R12:** The environmental aspects of sustainability deserve a separate follow-up based on a well-chosen set of physical indicators.

### Done

#### Recommendations

**R11 and R12:** a table of 15 Sustainable Development Indicators for France is now associated with the NSDS (produced by CGDD-SOeS and Insee) and was presented in short booklet format at the meeting of the CIDD that addressed the NSDS. There are also 35 second level sustainable development indicators also associated with the key challenges for the NSDS and four context indicators (*not linked to NSDS challenges*).

Several key NSDS indicators 'can be interpreted as variations of underlying stocks' (R11): per capita material consumption, carbon footprint of final demand, changes in common bird populations, and expansion of the artificialisation of land. These can constitute the foundation of a set of physical indicators of environmental pressures (R12).

A joint action commission of the 'Governance at five' type and a national conference to define sustainable development indicators (organisers: CGDD, Cese, Criis - *general recommendation from conclusion to report*).

**R12:** France's 'carbon footprint': CO<sub>2</sub> emissions arising from final demand, including those due to imports (CGDD-SOeS)

**R11 and R12:** material consumption including that due to imports (CGDD-SOeS)

**R12:** compendium of biodiversity indicators (CGDD-SOeS)

**R3 and R11:** estimation of costs of environmental damage not borne by the economy: the case of global warming (CGDD-SOeS)

**R11 and R12:** An expert examination of the Ecological footprint (CGDD-SOeS)

**R11:** report on the biodiversity economy and environmental services (CAS)

**R11:** net adjusted savings and other approaches to sustainability, some theoretical bases (Insee)

### Forthcoming (2<sup>nd</sup> half 2010-2011)

#### Recommendations

**R11:** estimation of CO<sub>2</sub> component of a household consumption basket (CGDD-SOeS, Ademe)

**R11 and R12:** 1<sup>st</sup> estimate of France's 'water footprint' using same methodology as for the carbon footprint (CGDD-SOeS)

**R12:** development of a territorial potential of biodiversity indicator (CGDD-SOeS, IGN, MNHN, Dreif)

**R11:** work in progress on sustainable development indicators (CGDD-SOeS and Insee) and on unpaid costs of depletion of natural resources (CGDD-SOeS)

**R11:** report from *Commission des comptes et de l'économie de l'environnement* (Environmental accounts and economy Commission) on economic drivers for conservation of biodiversity and ecosystem services (CGDD-Seeidd).

# Dashboard versus Green Accounts

## Dashboard

• Commission advises against aggregation of disparate data :

« **A single summary indicator could not encompass simultaneously all the complexity of economic activity, quality of life and sustainability of development** »

• It advises :

- **against** composite indicators which are normative since they **aggregate heterogeneous information by assigning scores and weights**, [ **nor does it adopt the «ecological footprint** »]

- **against** the calculation of « **green GDP** », since monetary assessment of environmental damages is extremely difficult and, above all, does not give any indication about changes in stocks of natural resources, thereby failing to signal possible over consumption, and consequently to measure the sustainability of development

- **recommends choosing indicators** that can be interpreted as variations of underlying **stocks**

- finds **interest for the World Bank's « net adjusted savings** » indicator since it integrates physical and human capital and the natural resources traded on markets. It suggests that an indicator of this family could be adopted as a monetary indicator of sustainability, if complemented with physical indicators measuring pressures on the environment.

## Comments

• Disparate data should never be aggregated...and (most important)

• **Physical indicators are necessary and they cannot be elaborated without relevant scientists,**

• ... but :

- collusion between ones who feared that Green accounts wouldn't be enough « green », and others who wanted to keep their « brown lenses » for examining growth? Who is indeed the winner?

- room for « greening » National Accounts

[ not only GDP, and this is not necessarily contradictory with the idea that a single summary indicator isn't appropriate]

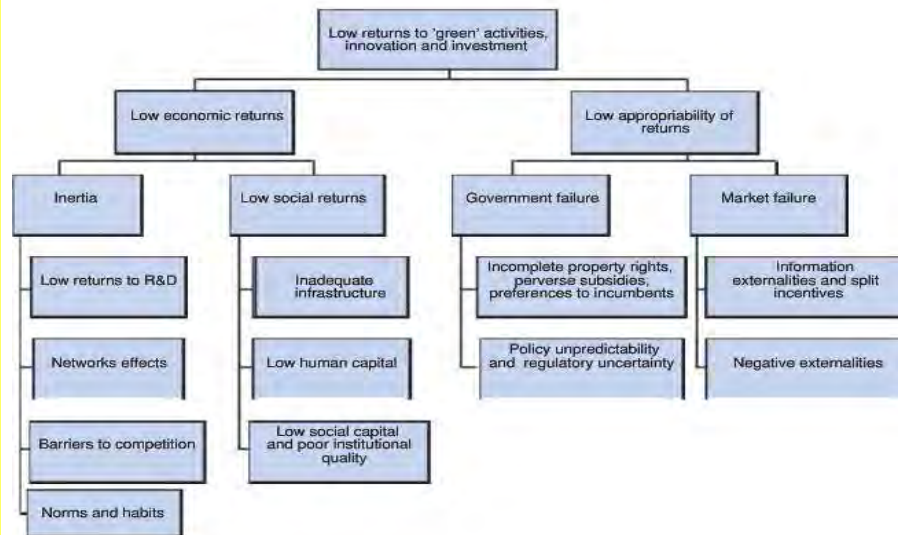
- **theoretical arguments for consistency with policies** (Arrow, Dasgupta, Mahler). French experience of **shadow values** for CO<sub>2</sub>, Safety, Risk, Discounting...(Boiteux, Lebègue, Gollier, Quinet)

> **Towards complementarity?**



# How to monitor GE/GG?

## Link with GG/GE diagnosis framework



## DPSIR framework relevance

- Key-challenges of GG are indeed those monitored with the DPSIR framework (climate change, water stress, premature deaths from pollution, biodiversity threats...)

- Reinforces the « **State** » step : natural asset base (**emphasis on stocks**)

- Need for a more « **systemic** » view of the DPSIR scheme, especially at « **Driving forces** » and « **Responses** » levels.

- **Example 1 : GES emissions of cities, urban spawl...**

- New items in Transportation and Housing Surveys

- **Example 2 : Land use, food, biodiversity**

- Identification of conflictual issues

- link with modelling

- The « **Impact** » step is crucial... but difficult (cf 2 nd group of the IPCC)