

# Global Systemic Risks Fresco - GRSF

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## 1 Context around the workshop

A whole part of the team studies Global Systemic Risks (GSR). Those risks emerge from interactions within a system in which vulnerabilities are present. Disrupting one or multiple elements can lead to entire system consequences. If elements are sensitive and sufficiently intertwined between each other, disruptions can spread over the whole system, triggering chain reaction effects and feedback.

Systemic thinking is not obvious [Von Bertalanffy, 1973]. Courses in education are often specialized, focusing on one or few themes or objects in particular. Students often go from one «subject» to the other, without linking them. «All other things being constant» type reasoning then implicitly arise. This kind of reasoning is consequently blind to interactions with - and vulnerabilities to - other objects change or disruptions.

Studying GSR logically implies systemic thinking as these risks result from elements interactions. Some PhD students (Borthomieu Alexandre, Berthe Antonin, Fauste Léon, Mathilde Jochaud du Plessix) created a game to vulgarise this kind of thinking.

The Global Systemic Risks fresco (*GSRF*, or «*Fresque des risques systémiques globaux*» in french) is a serious game for broaden understanding of this aspect. It enables participants to play with interactions within a system and with disruption spreading. The game is a visual and spatial representation of the core elements of western societies.

The GSRC project was included as a participating workshop in the Archipel<sup>1</sup> conference organised by STEEP team with following objectives:

- (i) To bring together a community of scientists from diverse backgrounds, adopting shared systemic approaches to global issues;
- (ii) To co-construct and consolidate frameworks of thought, knowledge and methodologies on global systemic risks, their assessment, and their mitigation;
- (iii) To make concrete progress in the production and dissemination of knowledge<sup>2</sup>

## 2 Presentation

To carry out this workshop, we chose to use the tool « Fresque » (greatly inspired by the Fresque du Climat)<sup>3</sup> which allows easily to gather several specialists and experts around a game and to « co-construct » a relevant support to question the participants (which answers the objective (ii) of the conference). These participative aspects will allow the participants to bring, through their discipline different visions of the world and knowledge that will be essential to build the fresco and thus realize the strong links between between their fields.

Given the necessity of the systemic approach to try to represent the world and being one of the main objectives of the conference (objective (i)), we have decided to create this fresco around the internal and external risks of our western and capitalist societies. This choice allows us both to try to sensitize the participants to the systemic stakes as well as to put forward rebound effects, «red queen » effect, bio-physical collapse and blocking points that grow along with our societies.

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<sup>1</sup><https://archipel.inria.fr>

<sup>2</sup>Citation from Archipel's website

<sup>3</sup><https://fresqueduclimat.org/>

Thanks to the material pedagogical tool that is the mural, we try to make the participants' imagination work through different scenarios (see section 2.1). We also hope that these scenarios will encourage participants to think about our needs in a new way in a degraded environment, and then eventually to create or imagine more resilient alternatives (objective (ii) and (iii)). As these topics are sources of discomfort and strong emotions, we want this session to end with a time for participants to share their feedback on what they have just experienced, as well as a time for sharing emotions, which we believe is now essential for any research or knowledge creation around social and environmental issues that affect each person in different ways. Moreover, we believe that this time allows participants to be accompanied in the «return to reality » and to limit the feeling of powerlessness.

## 2.1 Description of the GSRC

This workshop takes place in three stages: (i) the construction of the "fresque", (ii) the realization of breakthrough scenarios and (iii) a time of «return to reality ».

**Construction.** The fresco has 40 cards that represent important elements, nodes of our western societies: infrastructures, needs, resources, concepts and monetary, political and environmental elements. They have been chosen by taking inspiration from the nodes present in World3 [Meadows et al., 1972]. These 40 maps are divided into 5 very different but interdependent sets:

- The primary needs
- The means (which answer the primary needs)
- Energy/material production
- Finance and geopolitics
- The environment

This game starts with the distribution of the needs set and then the means set to the participants. They must then place the cards (a rough structure is provided) and begin to draw links between the cards that represent direct dependencies. The next sets are distributed by the facilitator in the order he or she wishes according to the affinities of the group. An example of a construction is shown in Figure 1. A list of the cards available for the mural is available in the appendix A.

**Scenario.** During this phase, we will be able to let the participants «play » with the "fresque" they have just built and their imagination. Participants choose a card that will determine the starting point of a collapse scenario. They are asked to imagine a situation capable of initiating the collapse of the chosen card and then to try to «place» themselves in time and space as individuals. Participants will then be asked to think about the cards directly impacted by this breakdown and then the cascading effects that might result. The goal of this phase is to determine at what point our primary needs are severely impacted. This phase will also allow the group to discuss alternatives that could prevent the disruption or avoid the disruption from reaching our primary needs.

**Return to reality** We want this game to be a phase that allows the participants to express what they have just experienced through the mural and the scenarios. They will be able to share their emotions and we will be able to collect their feedback on the experience. This stage is quite free and each facilitator can organize it in his own way.

## 3 Scientific project

The development of the project has 3 goals: 1) Understanding and studying Global Systemic Risks 2) Broaden understanding of these stakes 3) Contributing to the reflexive thinking about participative processes led by STEEP team.

Understanding Global Systemic Risks is complex by nature. These risks are prospective. Few past experiences allow having hindsight about how risks spread through sectors.

Having a systemic vision is necessary for identifying reliance and interactions. Misjudging links could render the representation of the risks incorrect, would that be by omission or by overestimation of reliance links.

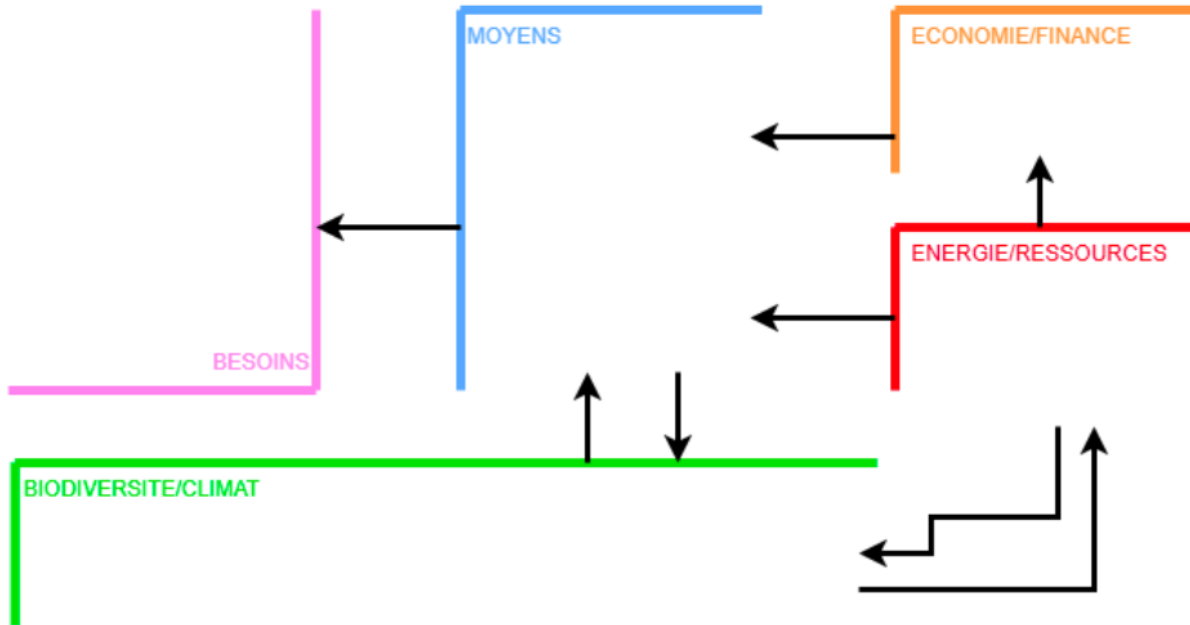


Figure 1: General structure of the fresco

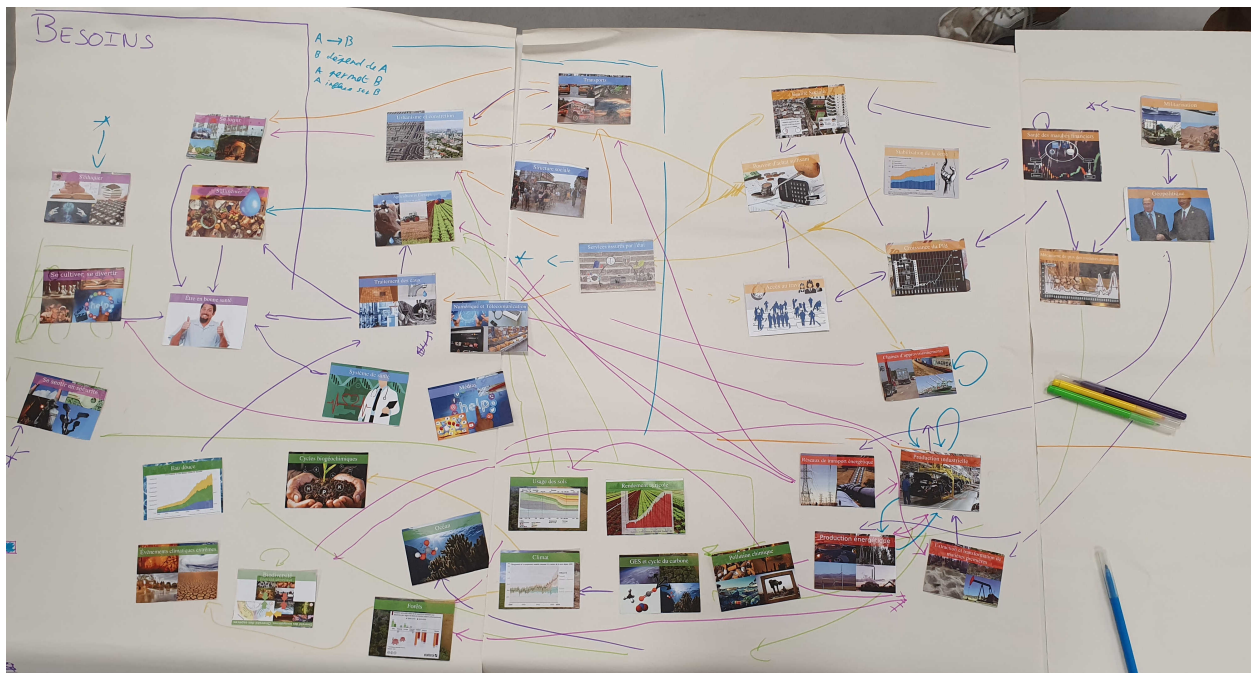


Figure 2: Structure designed by a group after phase I of the workshop

Estimating a link intensity also requires seeing clearly and precisely how it is characterised in real. That implies being quite exhaustive and precise about interactions of an element. Indeed, for some elements, more interactions would mean less dependency on each one individually because of substitutability.

The risks are context-dependant because of the continuous evolution of the system elements. The interactions between elements change with their individual evolution over time. Thus, a clear and precise reliance links' representation is expected to evolve over time.

Finally, the political nature of crisis management leads to the difficulty of the forecast of how a disruption would be traduced into crisis. The way disruptions spread throughout the system depends on elements interactions as well as on the consequent political reactions. These reactions are context-dependent (thought available resources, governing structures, and culture) thus different between regions, what makes representing them more difficultly.

The thinking for the conception of the workshop - by the GSR study it involves as well as the representation choices needed for putting it into a game - implies research on and analysis about these GSR.

Putting the workshop as a game allows it to be a popularization object. We then expect that the workshop brings the participants to think systemically and to better understand GSR. A better understanding of GSR would allow collectively giving more relevant answers to these stakes.

Part of the STEEP team research about participative processes. Conceiving serious games - making participants better thinking about stakes of the discussed decision - is part of the work. A reflexive thinking about serious game is thus in place.

The SGRC development joins these dynamics as it aims to be a educational tool. Next steps of the GSRC project include carrying out an experimentation for testing GSRC impacts on participants. That would tell us if the GSRC goals are reached, and give us material to think about the workshop conception and relevance.

## A List of cards sorted by set of the fresco

### Needs

- Eating and drinking
- Culture and entertainment
- Educating oneself
- Feeling safe
- To have a place to stay
- To be in good health

### Means

- Agriculture and livestock
- State
- Digital and Telecommunication
- Media
- Water treatment
- Social structure
- Transport
- Urban planning and construction
- Health system

### Energy/material Production

- Extraction and processing of raw materials
- Industrial production
- Supply chains
- Energy production
- Energy transport networks

### Environment

- Biodiversity
- Climate
- Biogeochemical cycles
- Freshwater
- Forests
- Extreme weather events
- GHG and carbon cycle
- Ocean
- Pollution
- Agricultural yields
- Soil use

### Finance and geopolitics

- Debt
- Geopolitics
- Financial Markets
- Social (In)Equality
- Military
- GDP
- Purchasing power
- Raw material prices
- Labour

## References

- [Meadows et al., 1972] Meadows, D. H., Meadows, D. L., Randers, J., and Behrens III, W. W. (1972). The limits to growth. *Club of Rome*.
- [Von Bertalanffy, 1973] Von Bertalanffy, L. (1973). The meaning of general system theory. *General system theory: Foundations, development, applications*, 30:53.

# Agriculture et Élevage



# S'alimenter et boire



# Extraction et transformation de matières premières



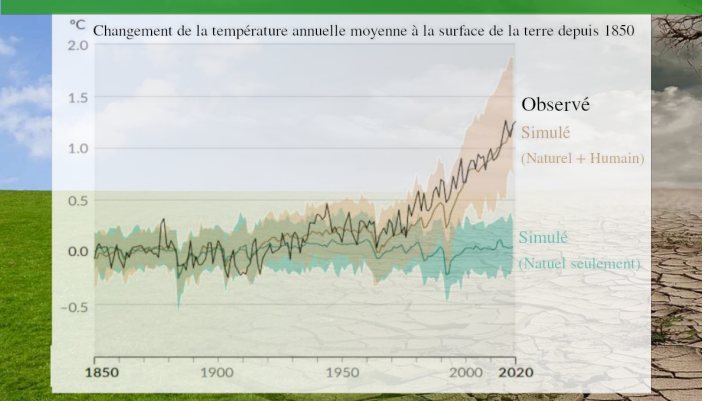
# Biodiversité



# Chaines d'approvisionnement



# Climat



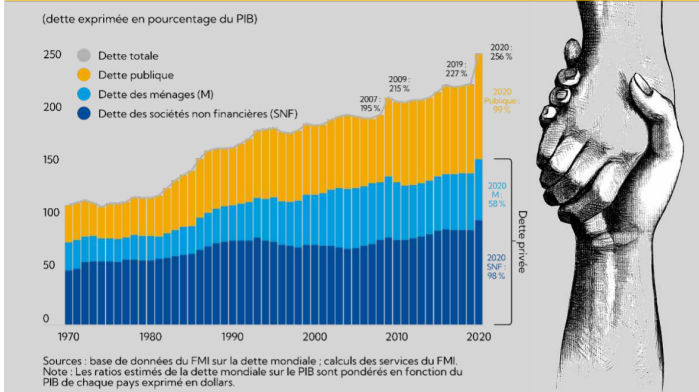
# Se cultiver, se divertir



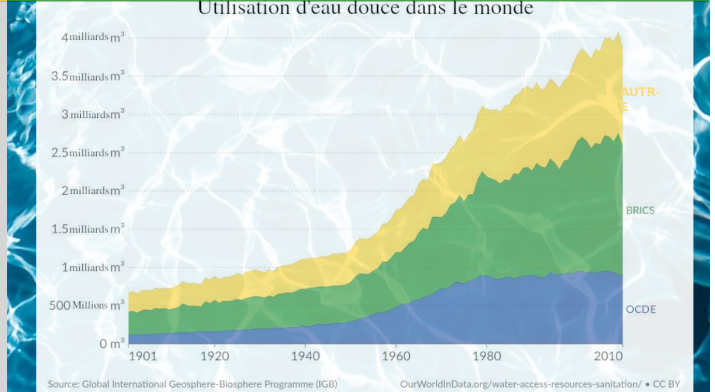
# Cycles biogéochimiques



# Dette



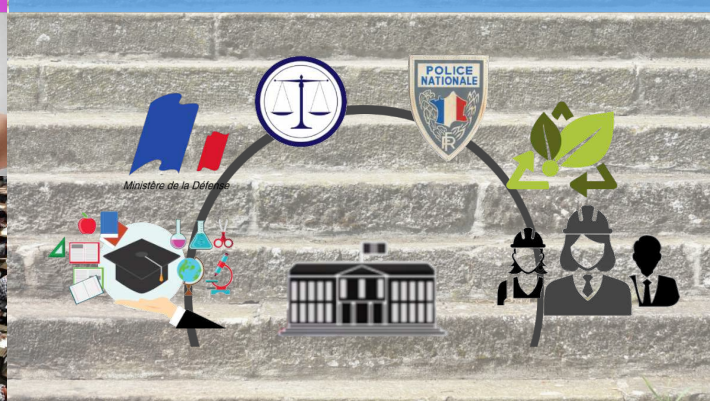
# Eau douce



# S'éduquer



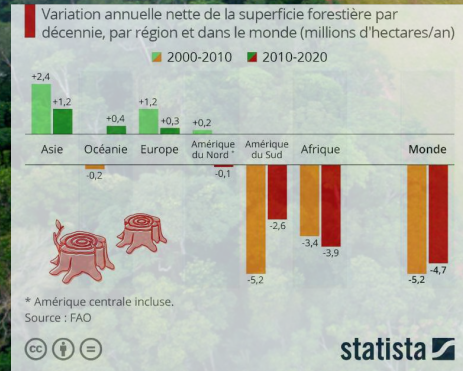
# État



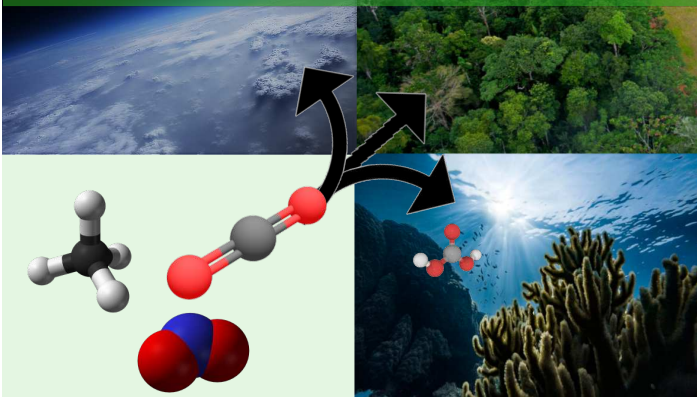
## Événements climatiques extrêmes



## Forêts



## GES et cycle du carbone



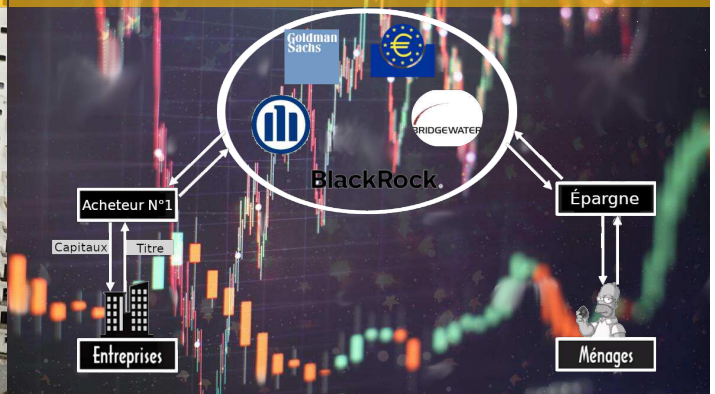
## Géopolitique



## (In)égalité Sociale



## Marchés financiers





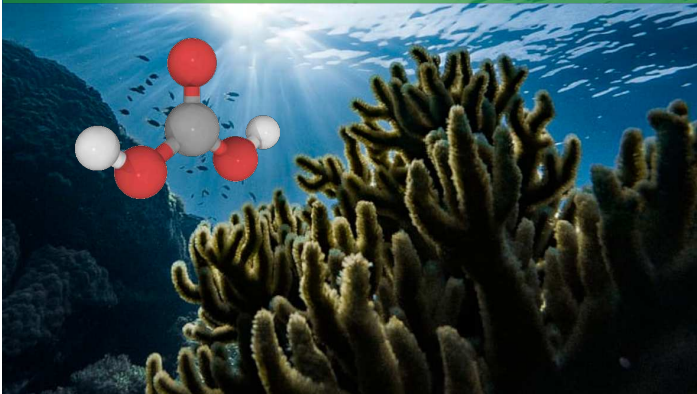
# Armée



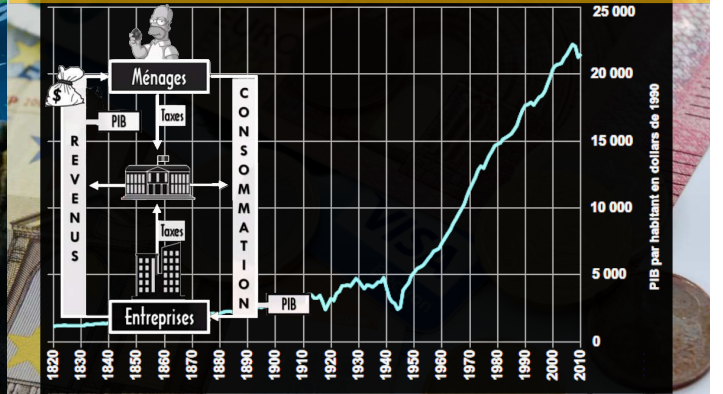
# Numérique et Télécommunication



# Océan



# PIB



# Pollution chimique



# Pouvoir d'achat



## Prix des matières premières



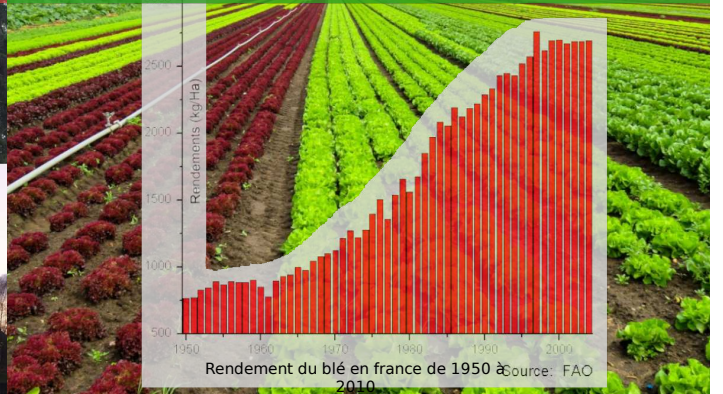
## Production industrielle



## Production énergétique



## Rendement agricole



## Réseaux de transport énergétique



## Médias





## Se loger



## Se sentir en sécurité



## Structure sociale



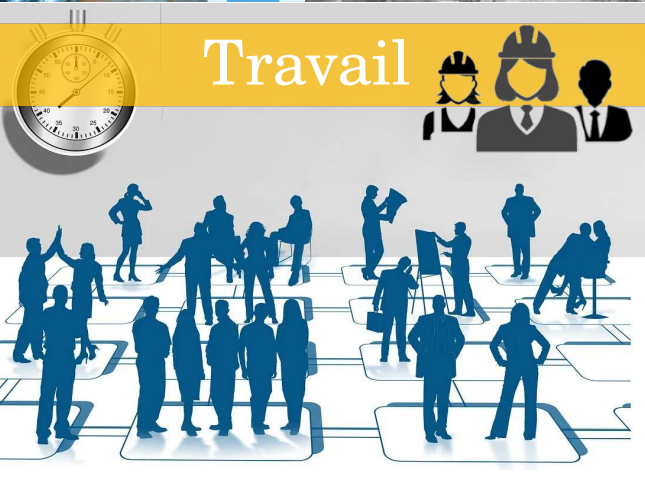
## Traitement des eaux



## Transports



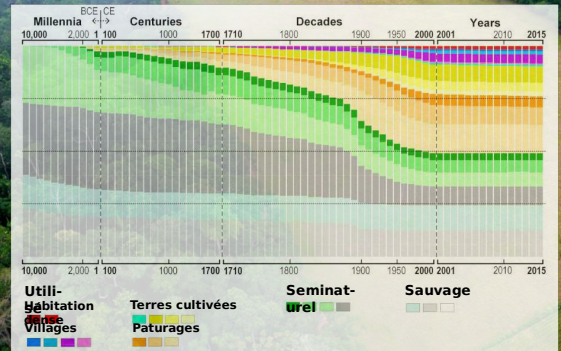
## Travail



## Urbanisme et construction



## Usage des sols



## Être en bonne santé



## Système de santé

