CONTINGENCY PLANNING of AIR NAVIGATION SERVICES

SASI Workshop

Service Continuity – Economic aspects
A complex decision-making process

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http://www.eurocontrol.int/ses/public/standard_page/sk_sesis_guidelines.html

What is the decision making process ?

How to choose the Strategy(ies)?

How much to invest?

ANSP

Airspace Users

Consultation

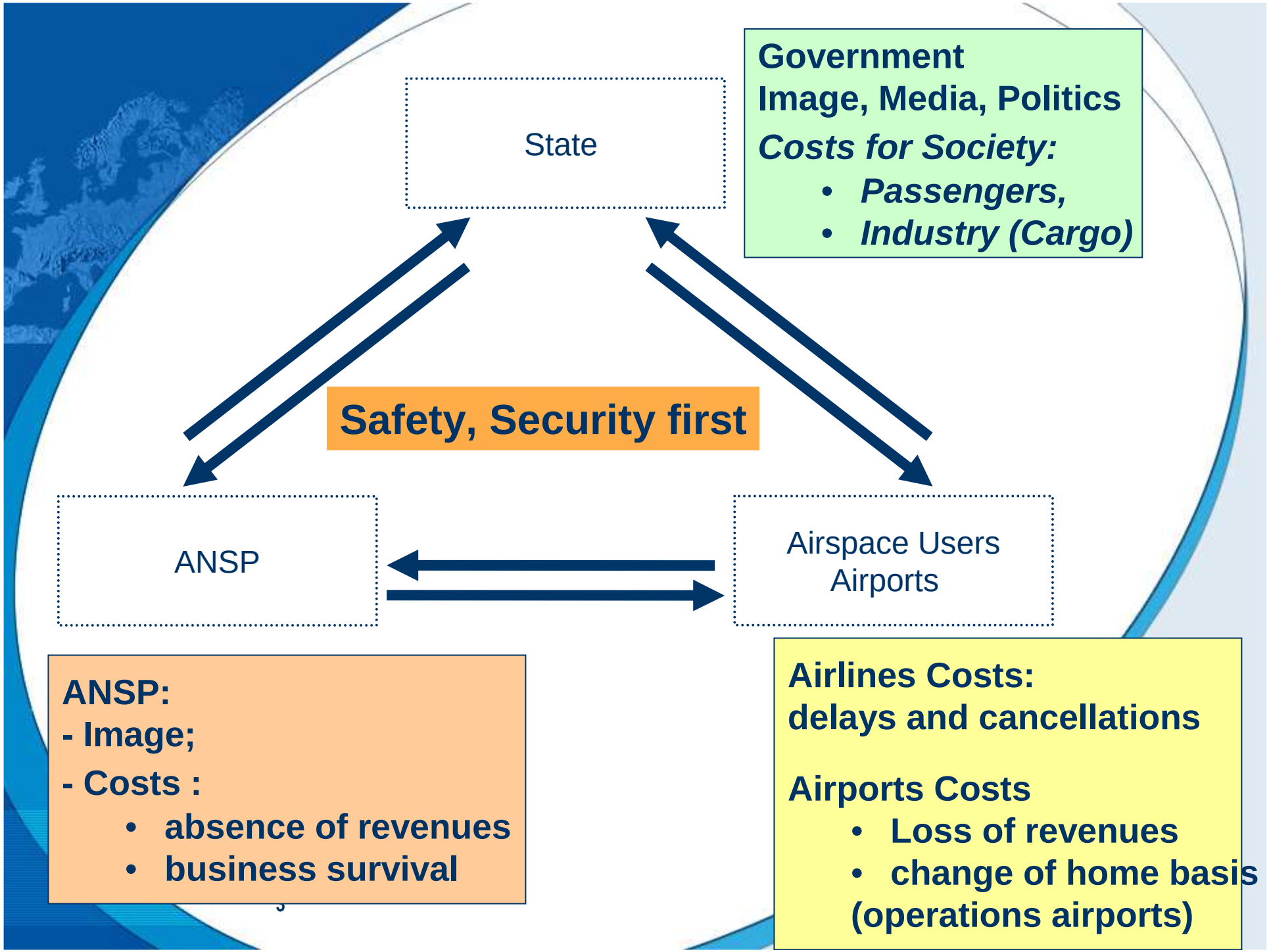
Airports

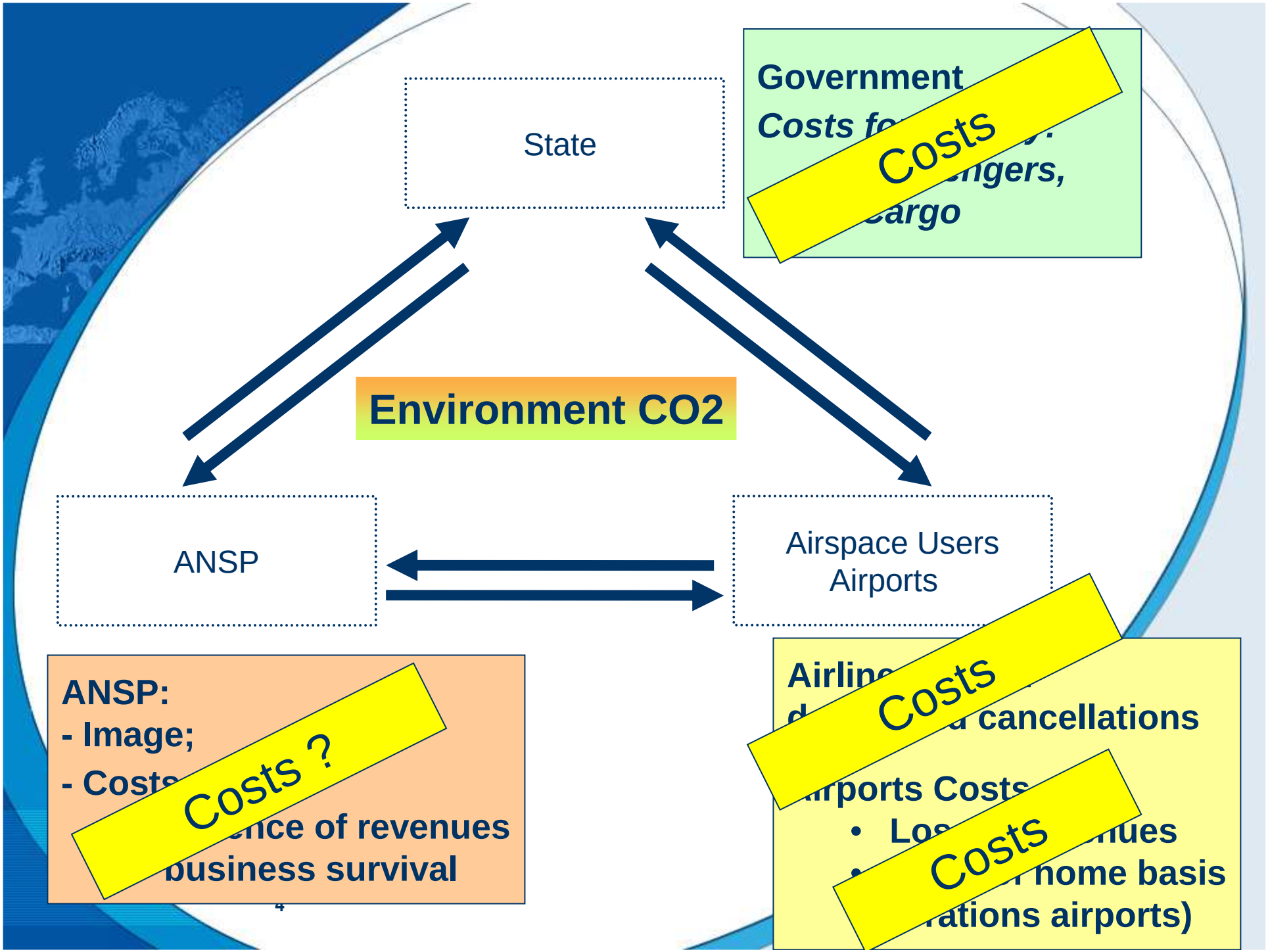
State Civil & Military Authorities

Planning

- Inventory of Services
- List causes
- Check existing plans
- Plan Contingency measures
- Plan Recovery back to Normal
- Document Contingency plans

Change Management


State
Government
Image, Media, Politics
Costs for Society:
• Passengers,
• Industry (Cargo)
Safety, Security first
ANSP
Airspace Users
Airports
ANSP:
- Image;
- Costs :
• absence of revenues
• business survival
Airlines Costs:
delays and cancellations
Airports Costs
• Loss of revenues
• change of home basis
(operations airports)


State
Government
Costs
Environment CO2
ANSP
Airspace Users
Airports
ANSP:
- Image;
Costs ?
business survival
Costs
cancellations
Costs

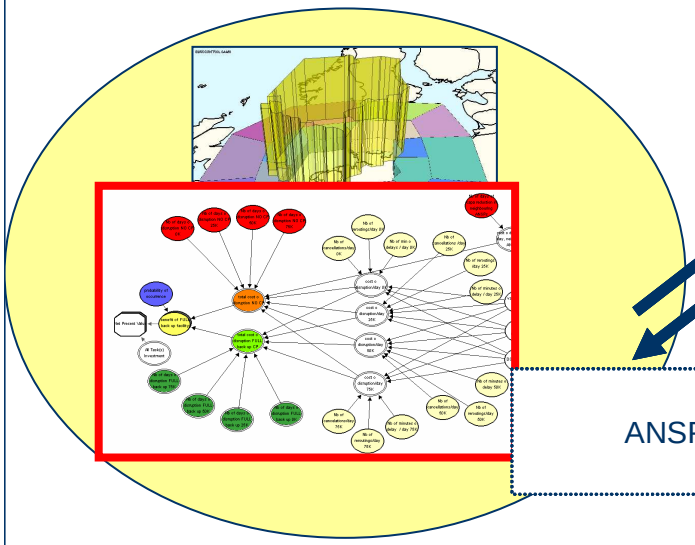
ANSP Policy Contingency
(re Service continuity)

Candidate Service Continuity Strategies

Operational Concept for Contingency (Basic)

Hazard reduction

Probability of disruptions



State

Topics to be Discussed ?

ANSP

Airspace Users
Airports

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envelope for Strategies

Selected Service Continuity Strategies

Support to Decision-making

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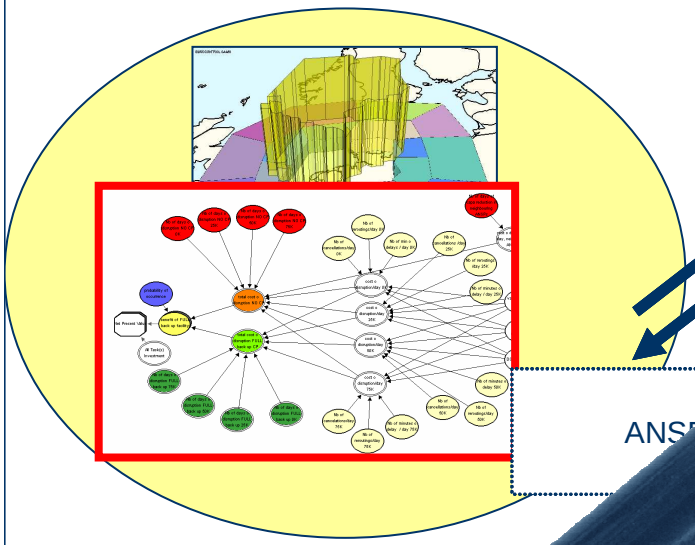


State

Airspace Users
Airports

enveloppe for Strategies

Selected Service Continuity Strategies

Support to Decision-making

Economic analysis of Service Continuity/ Hazards (1/2)

Critical dependency on the categories of outages against which hazards the ANSP decides (or is bound to) be protected:

- the **facility out of service** but the staff is operational *(e.g. flood, explosion at a moment when there is almost no staff present)*
- A **major software bug** has occurred;
- facility is operational but **part of the staff was hit** *(e.g. pandemics, explosion when staff is present) .*

Economic analysis of Service Continuity/ Hazards (2/2)

Cost of the mitigating measures differs:

- **Investments** to protect against destruction of facilities or the failure of hardware;
- staff outage requires **hiring and training** staff from school or external centres.

Expected duration of the outage – and resulting losses- differs:

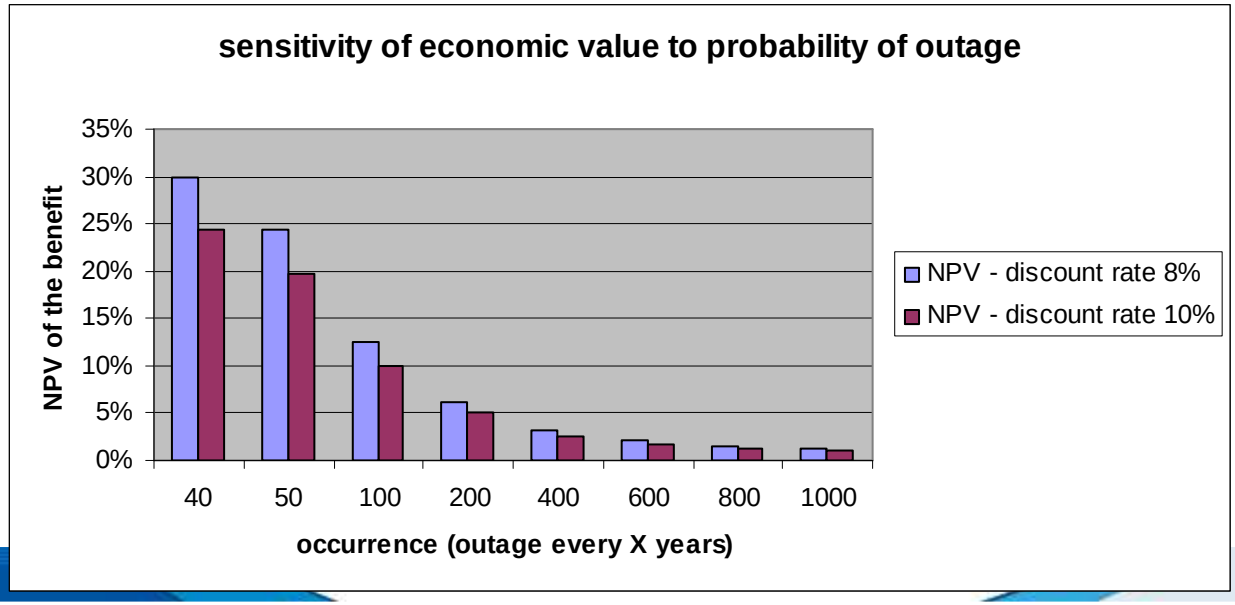
- a software bug (**unknown days or weeks to fix**);
- rebuilding an ACC will take **3 years or more**;
- hiring, and training staff in **years**.

Economic analysis of Service Continuity / Probability

- The probability of disruptions is an important factor;
- It differs from one category of events to another.

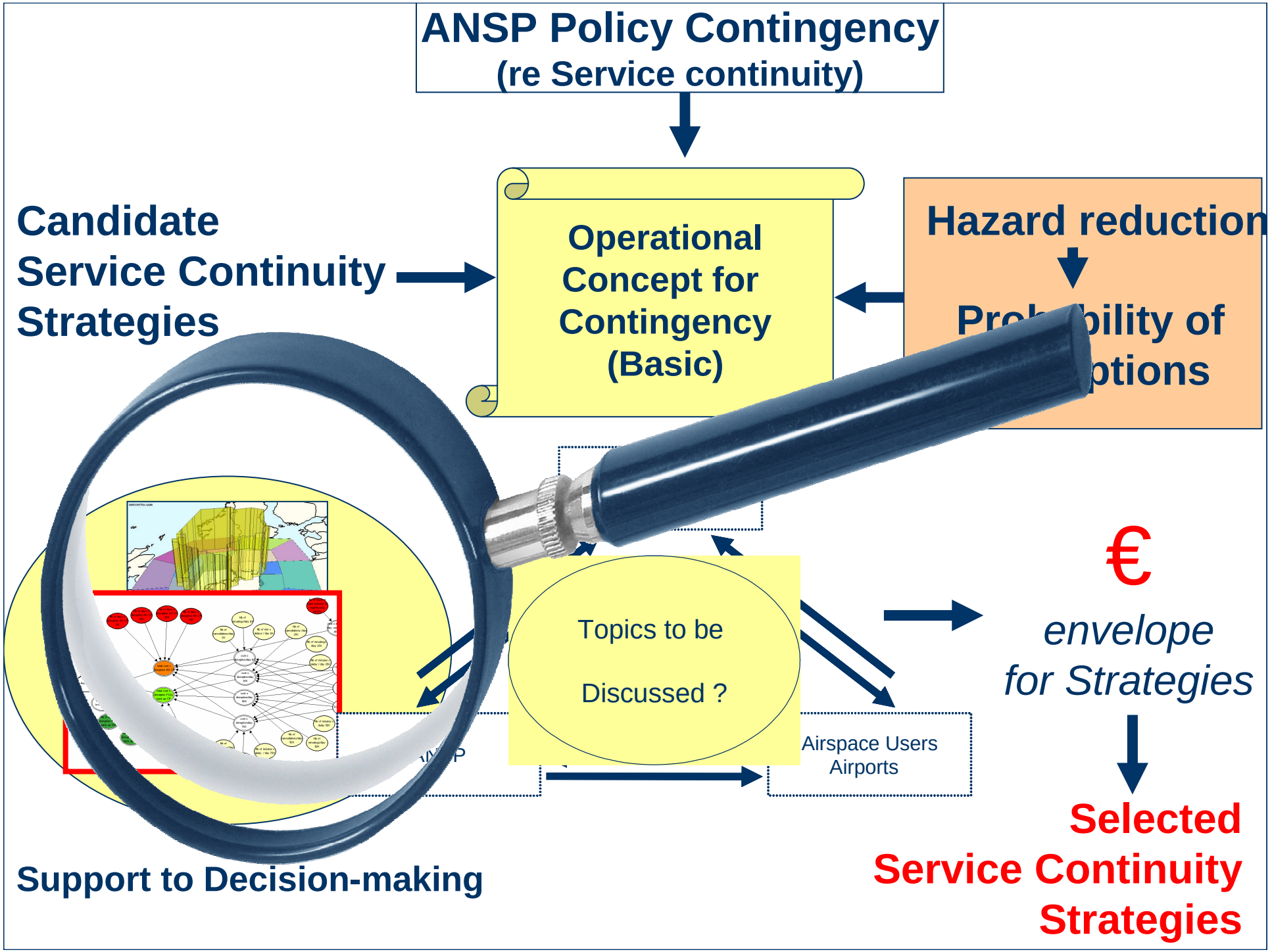
Event likely to occur in the life of an installation ; never occurred repeatedly on the site but was observed regularly on other sites	**About 10-1 per annum**
Ev… th…	**…er annum**
Ev… re… sites	**…er annum**

Probability to be discussed with experts in risks and disasters at local level



A benefit of:

- ***€1 million any time***
- *(but only once)*
- *over 40 years,*
- *values* ***€250 000 NOW***
- *with a discount rate of 8%*


ANSP Policy Contingency
(re Service continuity)
Candidate
Service Continuity
Strategies
Operational
Concept for
Contingency
(Basic)
Hazard reduction
Probability of
options
Topics to be
Discussed ?
Airspace Users
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envelope
for Strategies
Selected
Service Continuity
Strategies
Support to Decision-making

«DO NOTHING scenario»

For each unit under their responsibility,

ANSPs should identify the practical consequences

- **of having NO « service continuity » in place and,**
- **to react URGENTLY, with a risk of chaos**

in the aftermath of a disaster or major incident :

1. **Which technical capabilities would be affected ?**
2. **How long it would take to restore capacity and the pattern of capacity recovery ?**
3. **How that would impact capacity in neighbouring ACCs?**
4. **At what cost?**

«CONTINGENCY IN PLACE scenario»

For each unit under their responsibility,

ANSPs should identify the practical consequences

- **of having « SERVICE CONTINUITY » IN PLACE and,**
- **to react in a coordinated manner**

in the aftermath of a disaster or major incident :

1. **Which technical capabilities would be affected ?**
2. **How long it would take to restore capacity and the pattern of capacity recovery ?**
3. **How that would impact capacity in neighbouring ACCs?**
4. **At what cost?**

Comparisons (for illustration only)

Do Nothing scenario: 3 years to rebuild a facility

Capacity recovery	0 %	25 %	50 %	75 %	Total
Days spent in step	30	100	200	770	1100

Contingency in place scenario: 30 days to get 100%

Capacity recovery	0 %	25 %	50 %	75 %	Total
Days spent in step	1	1	7	21	30

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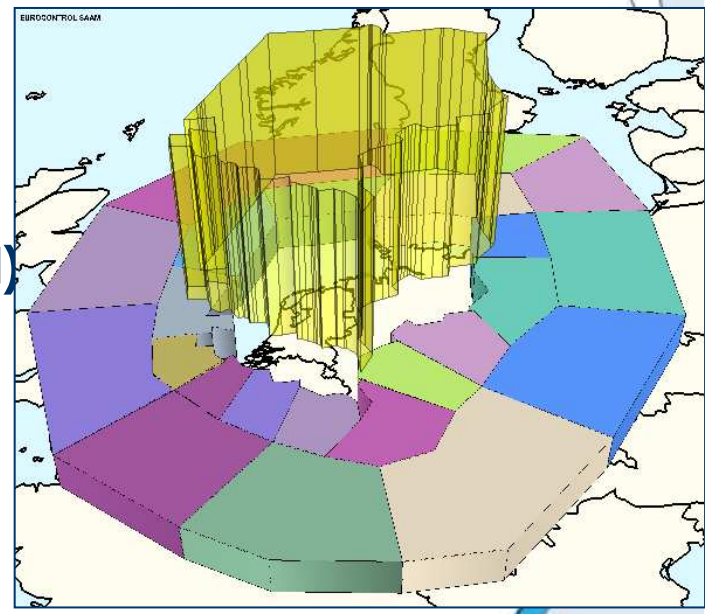
Network perspective

Effects of the « total/partial failure »:
- are NETWORK-WIDE for an En-route ACC;
- more local for a TMA failure.



NETWORK-WIDE SIMULATION TOOL (SAAM)

Effects of disruptions are inter-alia:

- **Minutes of delays for the delayed flights;**
- **Flights cancelled**
- **Extra mileage (NM) for the flights re-routed;**
- **Increase of flight duration for flights capped;**

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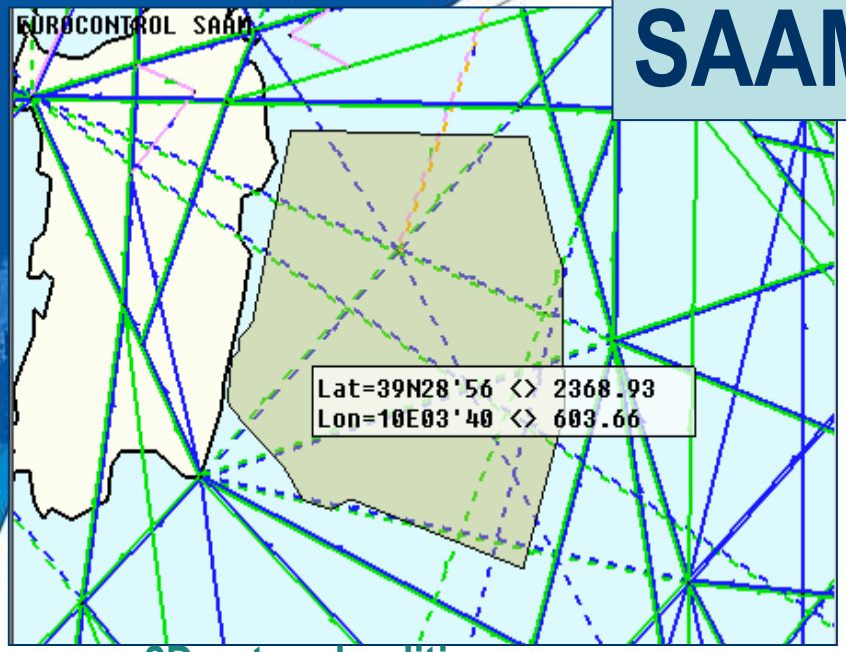
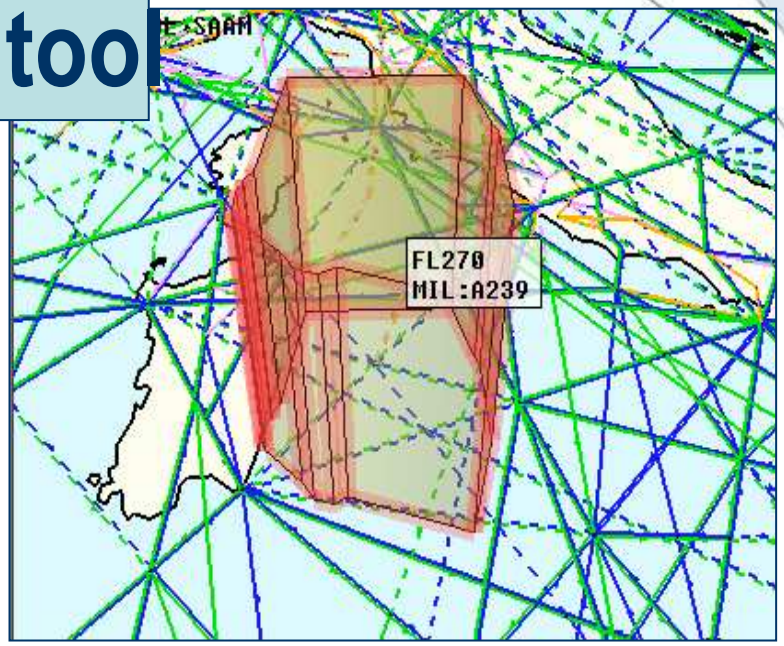
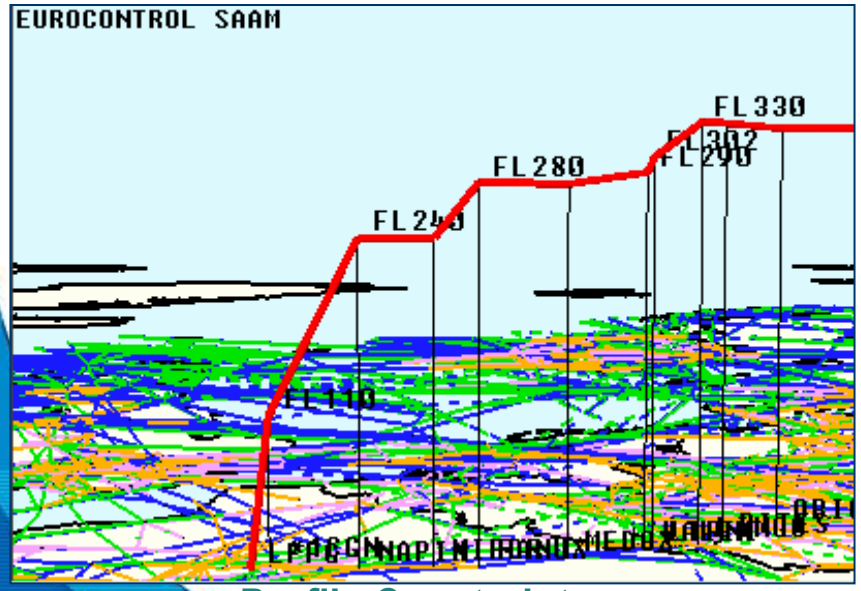
SAAM tool



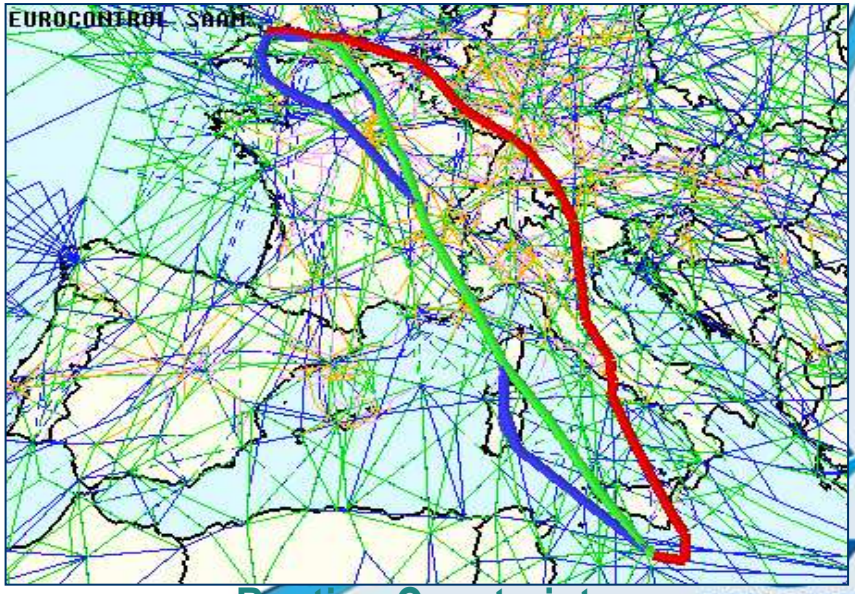
2D network edition



3D sectors edition



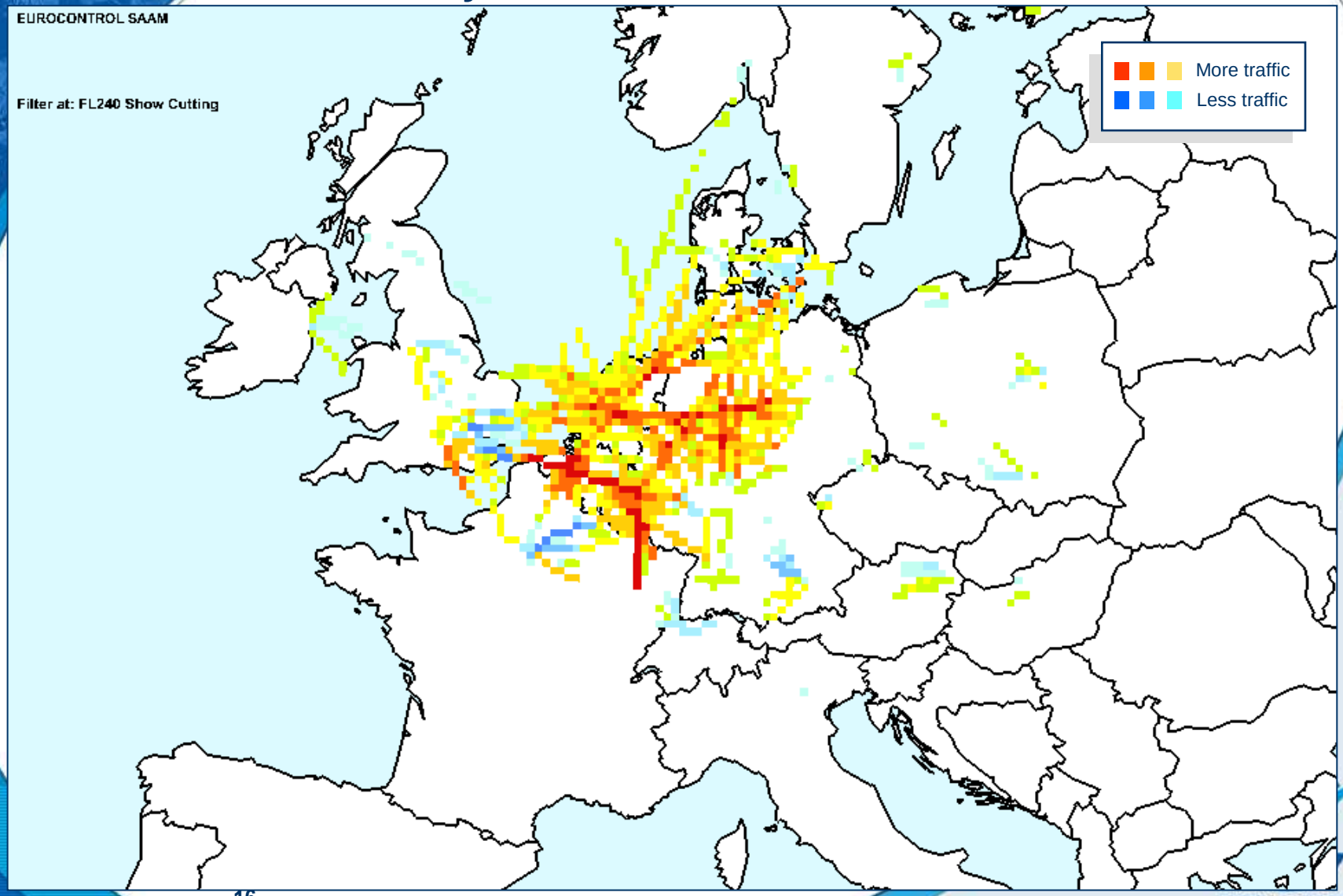
Profiles Constraints



Routing Constraints

Network Effect

Traffic Density below FL245 – 100% versus 0%



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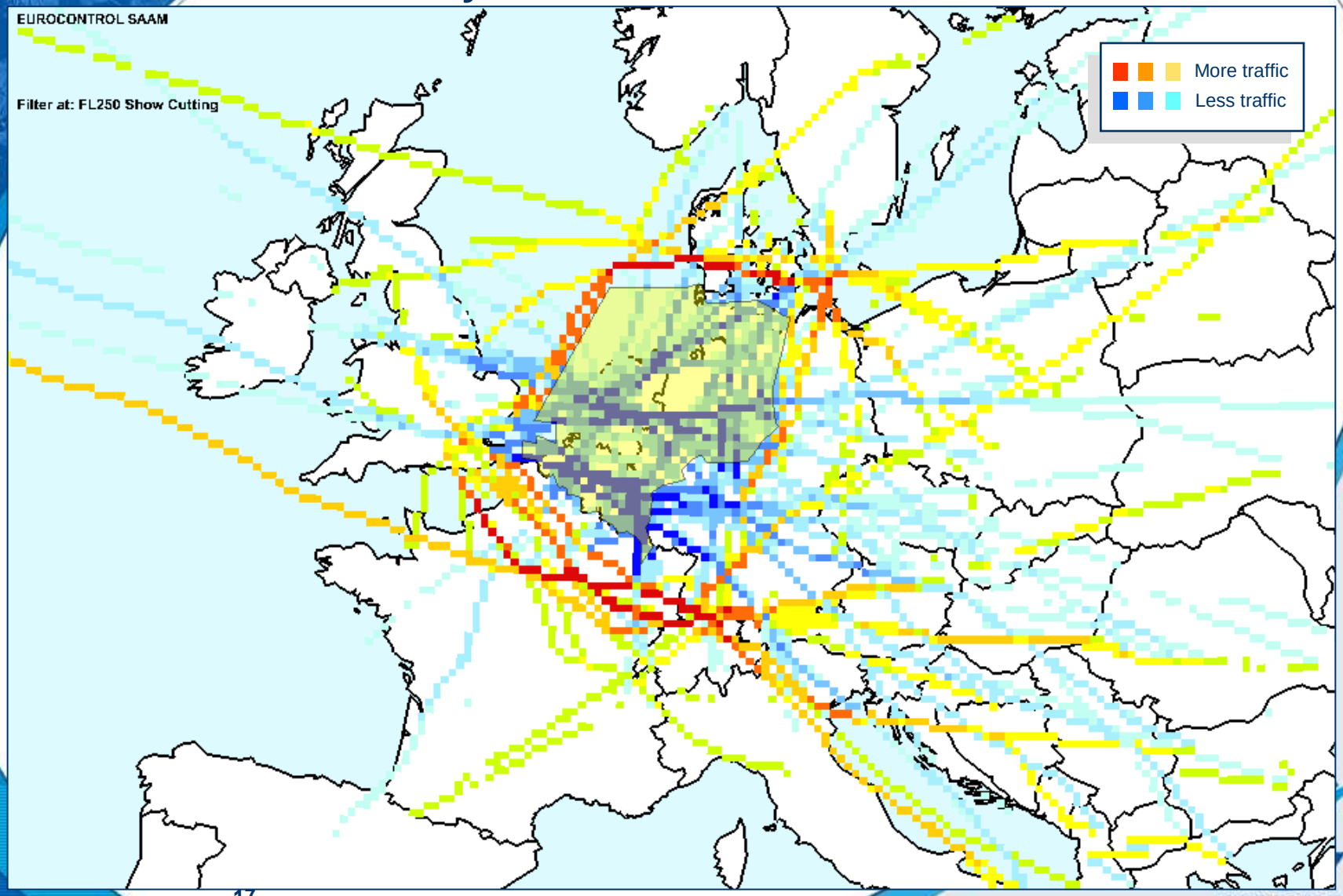

ANSP Policy Contingency
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Ca[illegible]ate
S[illegible]e Continuity
S[illegible]gies

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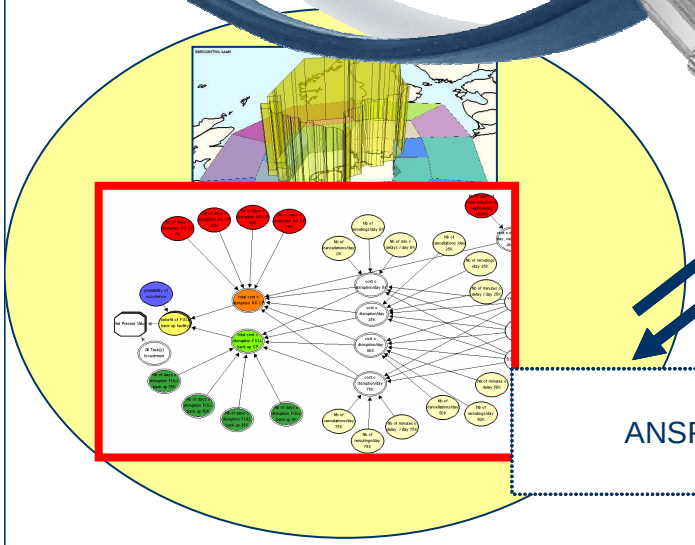

State

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ANSP

Airspace Users
Airports

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envelope for Strategies

Selected [illegible]ervice Continuity Strategies

Support to Decision-making

Economic analysis of Service Continuity / Benefits for AOs

So ANSP and AOs should discuss:

- **the costs for the AOs,**
  - **costs with advance notice (Service Continuity /** Strategic)

    are different and **LOWER**

    of the **costs with NO notice** (**Emergency**/tactical);
- **the behaviour of the AOs in case of long unavailability of airport capacity**:
  - the **home basis of operations could be changed**

Economic analysis of Service Continuity / Benefits for AOs

Order of magnitude of **Values for <u>Strategic costs</u>**

- Value of a minute of delay: circa 20-25€
- Cost of cancellation: circa 8000€
- Value of a flight (gain from an extra flight): circa 830€
- Cost of extra kilometers: circa 5€ a km;

Overall impact for AOs: several € Billion

Behaviour of the AOs in case of long unavailability of airport capacity is <u>UNKNOWN</u>

- Which companies will move their home basis ?
- To which airports ?
- Cost of diversion to surrounding airports: circa 4000€

Economic analysis of Service Continuity / Benefits for others

Impact of the outage of an ACC/TMA on the ANSPs

Loss of revenues – Actual values are to be defined locally

The following values are indicative only (order of magnitude):

- ATM/CNS revenue per flight hour, en-route: circa € 400
- ATM/CNS revenue per movement, terminal: circa € 100

Overall impact for ANSPs: several Hundreds € Millions

Impact of the outage on the Airports

Impact is a loss of revenues (percentage of turnover):

EQUALS

% of flights cancelled or diverted on other airports;

Overall impact for ANSPs: several Hundreds € Millions

Economic analysis of Service Continuity / Benefits for others

Impact of the outage on the Society

Difficult to evaluate in case of Service continuity:

– Passengers value of a minute of delay per flight € 40 to 50 is **tactical only;**

– **Impact on the local economy** (catchment are of the airport) is **dependent** of the **alternative means of transport** (rail, maritime ..)

€ Envelope for Strategies

Definition of the **Financial envelope** is a **complex issue**;

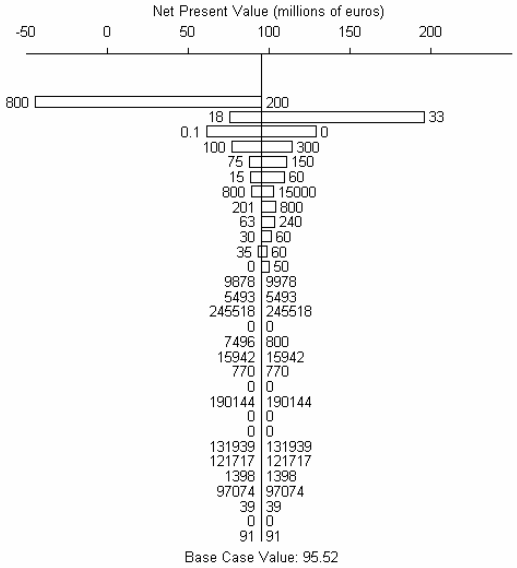
It depends of :

- **Operational concept**,
- **Hazards prevented**
  and their **combined probability**;
- **« DO NOTHING »** and
  « CONTINGENCY IN PLACE »
  scenarios;

Different views exist concurrently
(AOs, ANSPs, Airports);

Needs for good experts' judgment and sensitivity analysis

Variable	Base Case
probability of occurrence	200
value of min of delay	20.46
Cost of maintenance (%)	0.05
Nb of days o disruption NO CP 50K	200
Nb of days o disruption NO CP 25K	100
Nb of days o disruption NO CP 0K	30
value of cancellation	7465
Nb of cancellations/day 0K	201
Nb of cancellations /day 25K	63
Nb of days of capa reduction in neighbouring ANSPs	30
DOC per minute	45.96
Nb of cancellations/day 50K	0
Nb of minutes of reroutings /day 25K	9878
Nb of minutes of reroutings/day 50K	5493
Nb of min o delays / day 0K	245518
Nb of diversions / day 0K	0
value of diversion	3748
Nb of minutes of reroutings/day 0K	15942
Nb of days o disruption NO CP 75K	770
Nb of diversions / day 25K	0
Nb of minutes o delay / day 25K	190144
Nb of cancelations/day 75K	0
Nb of diversions / day 50K	0
Nb of minutes o delay 50K	131939
Nb of minutes o delay / day, neighbouring ANSPs	121717
Nb of minutes of reroutings/day 75K	1398
Nb of minutes o delay / day 75K	97074
Nb of reroutings /day, neighbouring ANSPs	39
Nb of diversions / day 75K	0
Nb of cancellations /day, neighbouring ANSPs	91



How to calculate the « Envelope » is still subject of Research

And How to reconcile the different views …

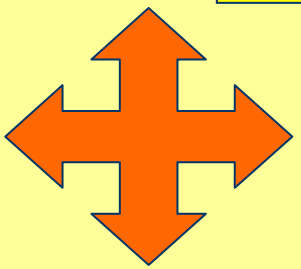
ANSP Costs :
- **absence of revenues**
- **business survival**

Network

Government

Costs for Society:
- ***Passengers,***
- ***Cargo***

Local



Airlines Costs:
delays and cancellations

Network

Airports Costs
- **Loss of revenues**
- **move of home basis**

Local

within a Decision Making process ?

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