ICAO CAPACITY & EFFICIENCY NO COUNTRY LEFT BEHIND

Performance-based Decision-making Method

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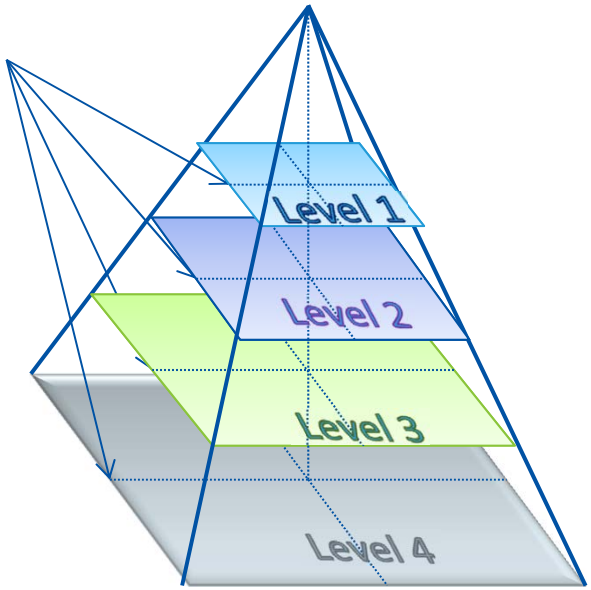
Mexico/22 August 2016

GANP 2019

LAYERS



COMPONENTS

EXECUTIVE

Vision

Conceptual Roadmap

Performance Objectives

PLANNING

FRAMEWORK

BBBs

ASBUs

PBA

ARCH.

REGIONAL

ANP

Vol I

Vol II

Vol III

R&D Programmes

NATIONAL

National Responsibility

Proposed Template?

National Plans

Deployment

*“Fall in love with the **problem**, not with the solution”*

What this method entails?

"Several procedures for meeting the **expectations of the aviation community** by **enhancing the performance** of the Air Navigation System and **optimizing** allocation and use of the available **resources**"

Principles

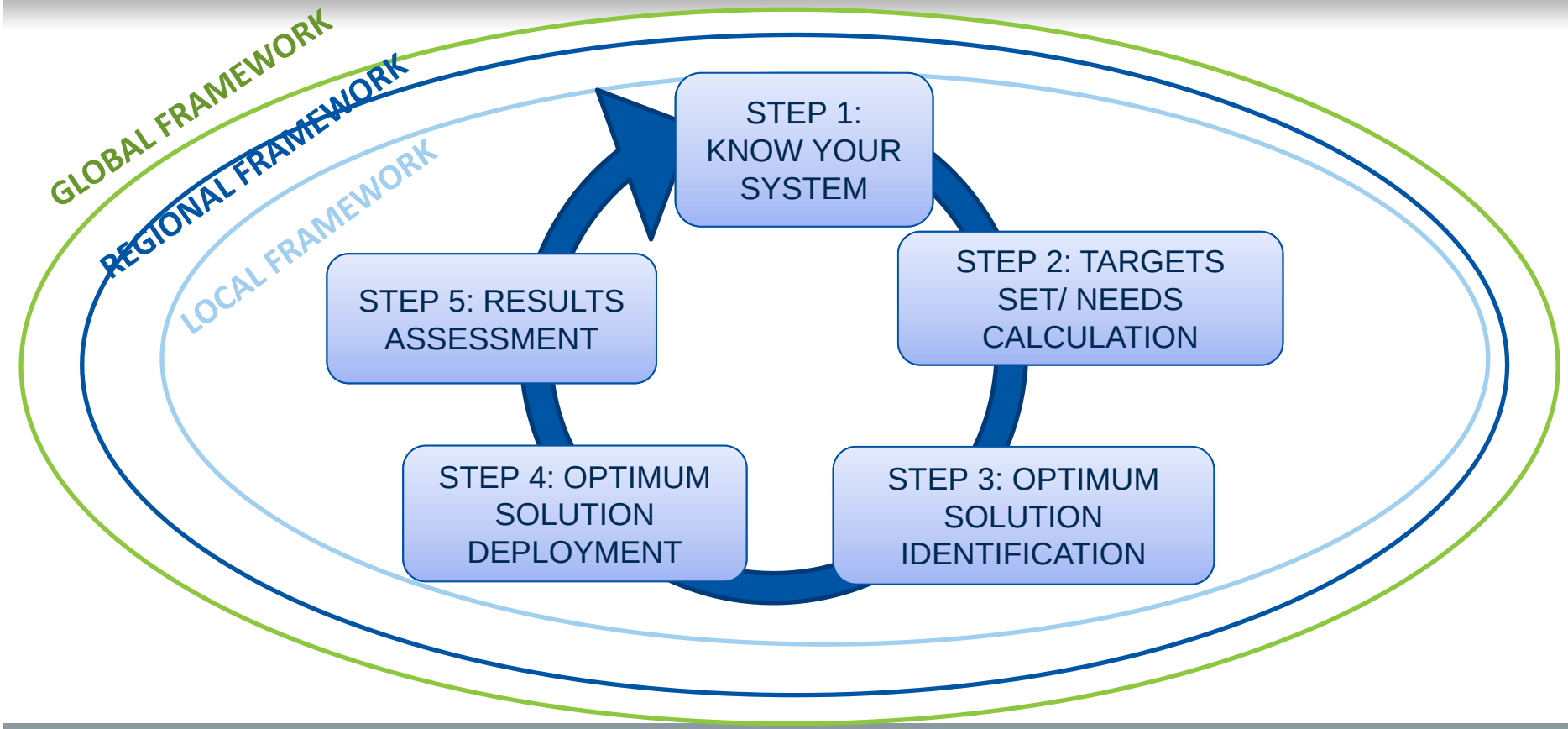
- Strong focus on desired/required results
- Reliance on facts and data for decision making
- Collaborative justified decision-making

The way to success

- Commitment
- Agreement on goals
- Organization
- Human resources and knowledge/expertise
- Data collection, processing, storage and reporting;
- Collaboration and coordination; and
- Cost implications

The Method

- STEP 1: Know your system
- STEP 2: Set of targets/ Calculation of needs
- STEP 3: Optimum solution identification
- STEP 4: Optimum solution deployment
- STEP 5: Results assessment


GLOBAL FRAMEWORK
REGIONAL FRAMEWORK
LOCAL FRAMEWORK
STEP 1: KNOW YOUR SYSTEM
STEP 2: TARGETS SET/ NEEDS CALCULATION
STEP 3: OPTIMUM SOLUTION IDENTIFICATION
STEP 4: OPTIMUM SOLUTION DEPLOYMENT
STEP 5: RESULTS ASSESSMENT

STEP 1:KNOW YOUR SYSTEM (KYS)

- Scope
  - Avoid misunderstandings
  - → Limits of responsibility and accountability
- Context
  - Global, Regional, Local
  - Make clear assumptions on what is “surrounding” it

STEP 1:KNOW YOUR SYSTEM (KYS)

- Identify ambitions and expectations
  - Expectation vs. ambition
  - ICAO KPAs
  - Global performance ambitions
    - Environment, Safety
    - Capacity, Efficiency, Predictability (GANP 2019)
  - Regional performance ambitions
    - ANP Vol III
  - National performance ambitions
    - Implementation
    - National Air Navigation Plans

STEP 1:KNOW YOUR SYSTEM (KYS)

- Operational analysis (baseline performance)
  - Data collection, process and analyse
  - Monitor current operations
    - KPIs (GANP 2016)
  - Traffic forecast

STEP 1:KNOW YOUR SYSTEM (KYS)

- SWOT Analysis
  - Strengths, Weaknesses, Opportunities and Threats

→Performance objectives

Example

- Performance management process.
- Scope:
  - FIR, TMAs and airports in AIP.
  - 25 years (5-year cycle).
  - Safety, capacity, efficiency, predictability and environment.

Example

- Context:
  - Traffic growth, RPAs, airports embed in cities, military activity, weather,…
  - Multiple neighbors
  - NACC

Example

- General ambition/expectation:

"To increase capacity along with efficiency and predictability in order to respond to future traffic growth, while ensuring that there are no adverse impacts on safety nor environment."

Example

- Operational analysis in FIRs, TMAs and airports within AIP:
  - Performance baseline
    - KPI02, KPI13, KPI04, KPI05, KPI08, KPI16, KPI09, KPI10,KPI06, KPI11, KPI01, KPI14, KPI15
  - SWOT analysis

Example

- Airport Y:
- Scope limited to airside of the airport, including TMA. Airport terminal is out of scope.
  - Performance baseline
    - KPI02, KPI13, KPI16, KPI09, KPI10, KPI11, KPI01, KPI14, KPI15
    - Forecast
  - SWOT analysis

Example

- SWOT analysis:
  - Strengths:
    - manpower
  - Weaknesses:
    - 2 runways separate 300 m → dependent operations
    - HUB operations
    - Separation on final (absolute values and application)
  - Opportunities:
    - New technology and procedures
  - Threads:
    - Weather
    - Topography surrounding airport Y
    - Airport Y physical capacity restriction

STEP 2: TARGETS & NEEDS

- Agree & Prioritize performance objectives
  - Focus area within KPAs

  →Performance objectives
  - Prioritization

STEP 2: TARGETS & NEEDS

- **SMART** Objectives
  - **S**pecific
  - **M**easurable
  - **A**chievable
  - **R**elevant
  - **T**ime-bounded

STEP 2: TARGETS & NEEDS

- **SMART** Objectives
  - **S**pecific
  - **M**easurable

  } PERFORMANCE INDICATORS → ***ICAO KPIs Catalogue***

  - Achievable
  - Relevant
  - Time-bounded

STEP 2: TARGETS & NEEDS

- **SMART** Objectives
  - **S**pecific
  - **M**easurable
  - **A**chievable
  - **R**elevant
  - **T**ime-bounded

PERFORMANCE INDICATORS

VALUE= f(baseline)

SPEED PROGRESS

PERFORMANCE BASELINE

PERFORMANCE TARGETS

PERFORMANCE NEEDS

Example

- Airport Y
- Focus area:
  - Capacity
    - Airport capacity
      - Runway capacity
  - Efficiency
    - Airport efficiency
      - Taxi in and out efficiency
- WHAT?

Example

- Airport Y
- WHAT?
  - Objective 1: to increase the airport acceptance rate while maintaining safety
  - Objective 2: to improve the efficiency of ground operations during heavy traffic time-periods, while maintaining safety and minimizing environmental impact.

Example

- Airport Y
- Performance targets
- Specific and measurable:
  - Objective 1: KPI09, KPI11
  - Objective 2: KPI02, KPI13, KPI16

Example

- Airport Y
- KPI09: Airport peak arrival capacity
  - For each arriving flight:
    - Actual landing time (ALDT)
    - Estimated landing time (ELDT) (from flight plan)
  - For each time interval:
    - Declared landing capacity of the airport

KPI ID	KPI09
KPI Name	**Airport peak arrival capacity**
Definition	The highest number of landings an airport can accept in a one-hour time frame (also called declared arrival capacity, or airport acceptance rate)
Measurement Units	Number of landings / hour
Variants	None
Operations measured	The capacity declaration of an airport
Object(s) characterized	The KPI is computed for individual airports
Utility of the KPI	This KPI indicates the highest landing rate that an airport will accept, using the most favorable runway configuration under optimum operational conditions. The runways may or may not be the most constraining factor for airport capacity: at some airports the most constraining factor may be the terminal airspace, the taxiways, the number of gates, passenger handling capacity etc. The KPI is typically used for scheduling and ATFM purposes, and to develop capacity investment plans.
Parameters	None
Data requirement	Scheduling parameters for slot controlled airports Airport Acceptance Rates (AAR)
Data feed providers	Airports
Formula / algorithm	At the level of an individual airport: 1. Select highest value from the set of declared arrival capacities 2. Compute the KPI: convert the value to an hourly landing rate, if the declaration is at smaller time intervals
References & examples of use	Comparison of ATM-Related Operational Performance: U.S./Europe (June 2014) CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

Example

- Airport Y
- Performance targets
- Achievable, relevant and time bound
- KPI09: airport peak arrival capacity
  - Baseline
    - Runway system:
      - Declare capacity of the system runway 40 operations → Airport peak arrival capacity of the system runway: 20 arrivals/hour
      - Actual throughput: 35 operations
      - Typical busy hour demand of 50 operations
      - Two non independent runways separated by 305 m
      - Operated as a single runway (one runway for departures and one for arrivals)
  - Traffic growth forecast for the next 25 years: 8%

Example

- Airport Y
- KPI09: airport peak arrival capacity
  - Performance target:
    - It is decided to adopt the future typical busy hour demand as the capacity target. This results in:

      50x1.08^25=340 operations → 170 arrivals per hour
    - The best in class airport peak arrival capacity for two dependent runways is 60 operations, thus the limit of the infrastructure capacity of the airport to accommodate the forecast demand will be reached in 3 years
    - So the performance target for a short term will be limited by the infrastructure of the runways to 60 operations. A longer term solution, such as the construction of a new airport should be considered.
    - Airport peak arrival capacity of the system runway: 60 arrivals/hour
  - Performance needs:
    - Airport peak arrival capacity of the runway system: 60-40=20 arrivals/hour

Example

- Airport Y
- KPI11: AIRPORT PEAK CAPACITY UTILIZATION
  - For each arriving flight:
    - Actual landing time (ALDT)
    - Estimated landing time (ELDT) (from flight plan)
  - For each time interval:
    - Declared landing capacity of the airport

KPI ID	KPI11
KPI Name	**Airport arrival capacity utilization**
Definition	Airport arrival throughput (accommodated demand) compared to arrival capacity or demand, whichever is lower
Measurement Units	%
Variants	Variant 1: IFR arrivals only
Operations measured	The number of unaccommodated landings at an airport
Object(s) characterized	The KPI is computed for individual airports
Utility of the KPI	This KPI assesses how effectively arrival capacity is managed by the ANSP. It is a measure of accommodated demand, compared to the available capacity of the airport, irrespective of the delay incurred by arriving traffic. Seen in another way, it captures the "missed" arrival slots. At congested airports, the KPI relates the throughput to the declared capacity. At uncongested airports (or airports without declared capacity) the KPI relates the throughput to the unconstrained demand based on flight plans.
Parameters	Time interval at which to perform the most granular calculations. Recommended value: 15 minutes.
Data requirement	For each arriving flight: - Actual landing time (ALDT) - Estimated landing time (ELDT) (from flight plan) For each time interval: - Declared landing capacity of the airport
Data feed providers	Airports
Formula / algorithm	For each time interval: 1. Compute the throughput: count the number of actual landings based on ALDT 2. Compute the demand: count the number of estimated landings based on ELDT 3a. if demand >= capacity: utilization = throughput / capacity 3b. if demand < capacity: utilization = throughput / demand At aggregated level (longer time periods): 4. Compute the KPI: sum(utilization*demand) / sum(demand)
References & examples of use	CANSO Recommended KPIs for Measuring ANSP Operational Performance (2015)

Example

- Airport Y
- KPI11: airport arrival capacity utilization
  - Baseline
    - Runway system:
      - Declare capacity of the system runway 40 operations → Airport peak arrival capacity of the system runway: 20 arrivals/hour
      - Actual throughput: 25 operations
      - Typical busy hour demand of 50 operations
      - Two non independent runways separated by 305 m
      - Operated as a single runway (one runway for departures and one for arrivals)
  - Traffic growth forecast for the next 25 years: 8%

Example

- Airport Y
- KPI11: airport arrival capacity utilization
  - Performance target:
    - It is decided to adopt the future typical busy hour demand as the capacity target. This results in:

      50x1.08^25=340 operations → 170 arrivals per hour
    - The best in class airport peak arrival capacity for two dependent runways is 60 operations, thus the limit of the infrastructure capacity of the airport to accommodate the forecast demand will be reached in 3 years
    - In this case, within in 3 years the capacity is expected to reach the demand and the target in this case will be set in 1, so the throughput to be equal to the demand and the capacity.
    - Airport arrival capacity utilization of the system runway: 100%
  - Performance needs:
    - Airport arrival capacity utilization of the runway system: 1-25/40=0.375= 37.5%

STEP 3: IDENTIFICATION OPT. SOLUTION

- Assessment of the SWOT analysis
  - Dominant factors:

    main constraints/opportunities

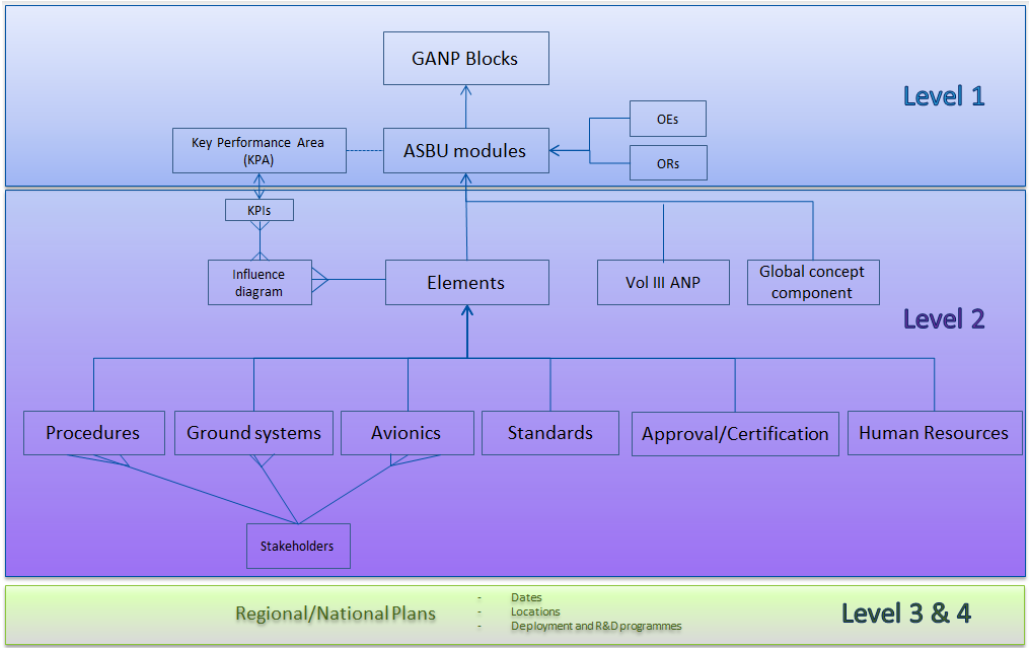
    → selection and prioritization of opportunities and issues

STEP 3: IDENTIFICATION OPT. SOLUTION

- List of options
  - High-level strategy
  - Operational concept
  - Technical enablers
  - Baseline
  - Availability
  - Safety Assessment
  - Human Factors Assessment
  - Assessment of expected performance

ASBU Framework

STEP 3: IDENTIFICATION OPT. SOLUTION



STEP 3: IDENTIFICATION OPT. SOLUTION

- Make decisions
  - Information available
    - Scope
    - Performance objectives and targets
    - Assessment of SWOT analysis
    - List of solutions (ASBUs)
    - Safety Assessment, HP Assessment, CBA and Environment Impact Assessment
  - Single optimum solution or a roadmap of optimum solutions

Example

- Airport Y
- Airport capacity
  - KPI09: Airport Peak Arrival Capacity
  - KPI11: Airport Arrival Capacity Utilization

Example

- SWOT analysis:
  - Strengths:
    - manpower
  - Weaknesses:
    - 2 runways separate 300 m → dependent operations
    - HUB operations
    - Separation on final (absolute values and application)
  - Opportunities:
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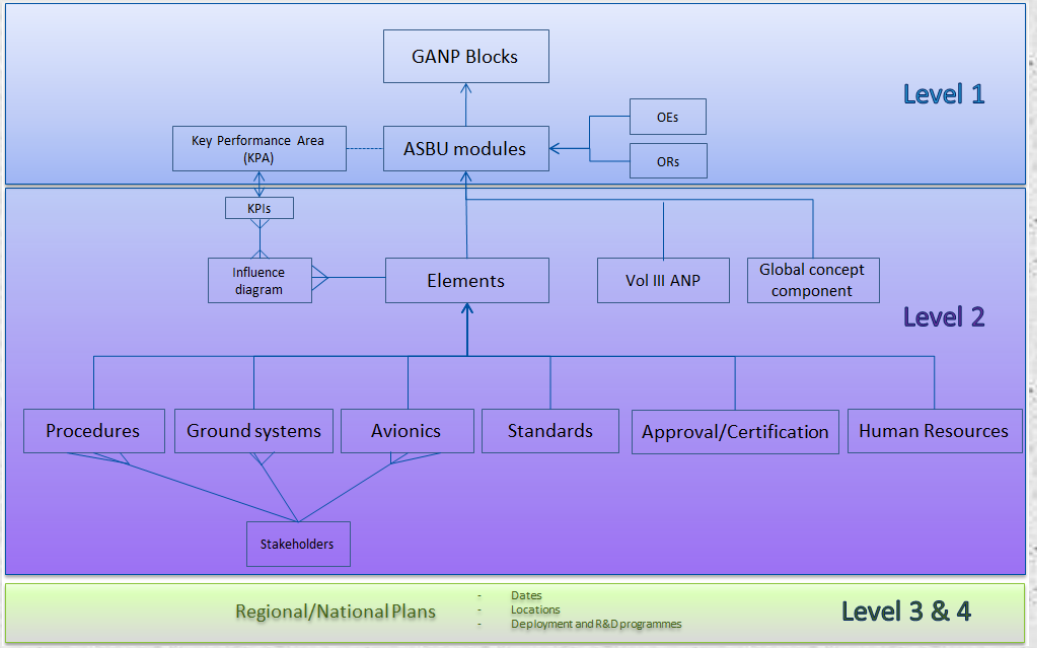
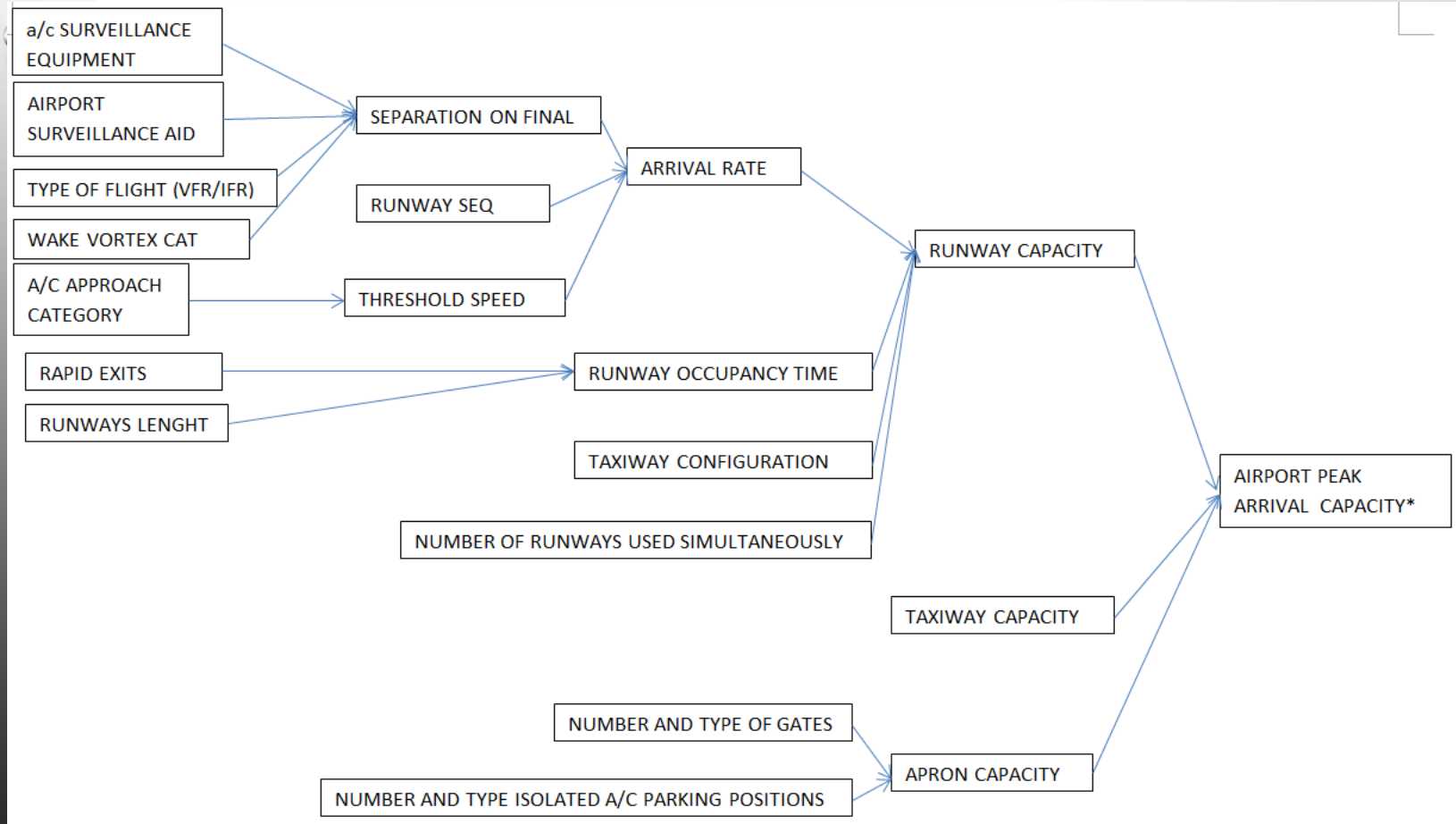


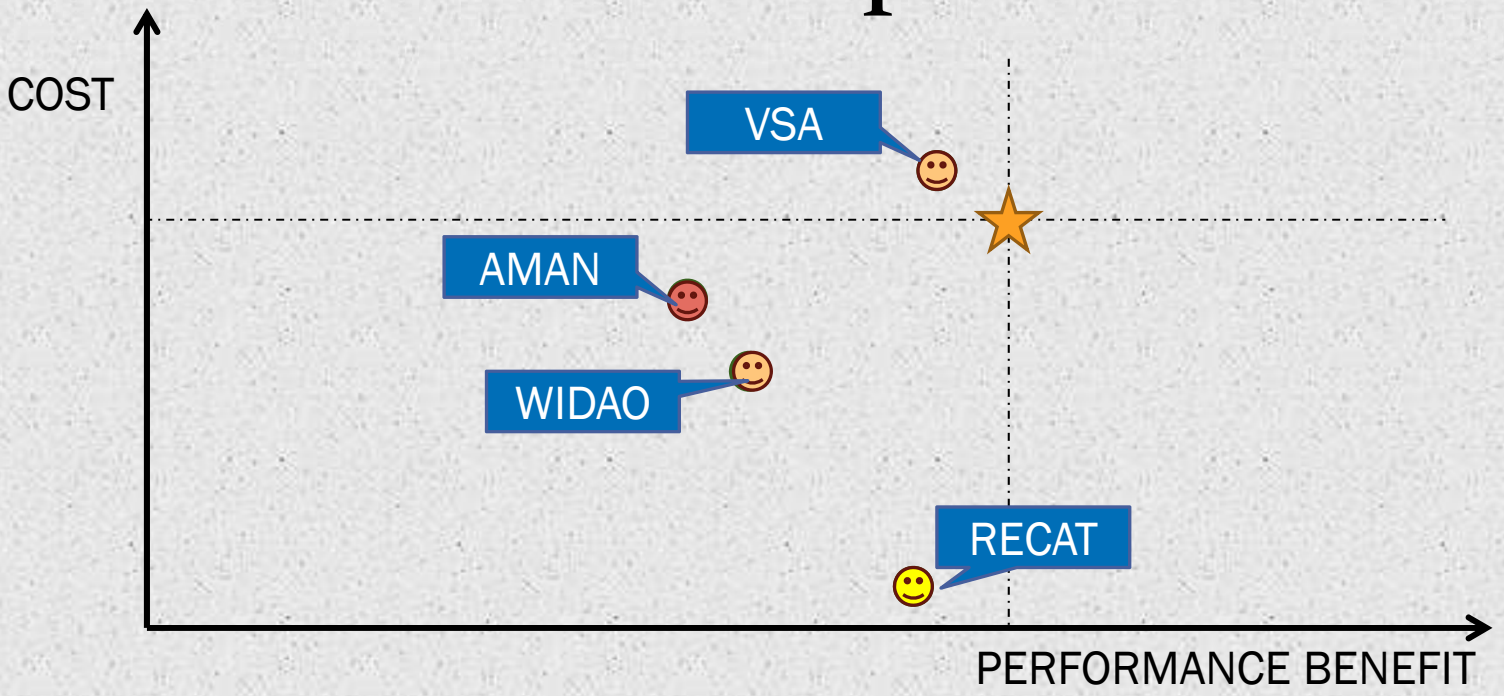


* Airport Peak Arrival Capacity, the highest number of landings an airport can accept in a one-hour time frame (also called declared arrival capacity, or airport acceptance rate).

Example

- Separation on final:
  - B0 WAKE:
    - RECAT
  - B0 ASEP
    - VSA
- Number of runways used simultaneously
  - B0 WAKE
    - WIDAO
- Aircraft sequencing
  - B0 RSEQ
    - AMAN

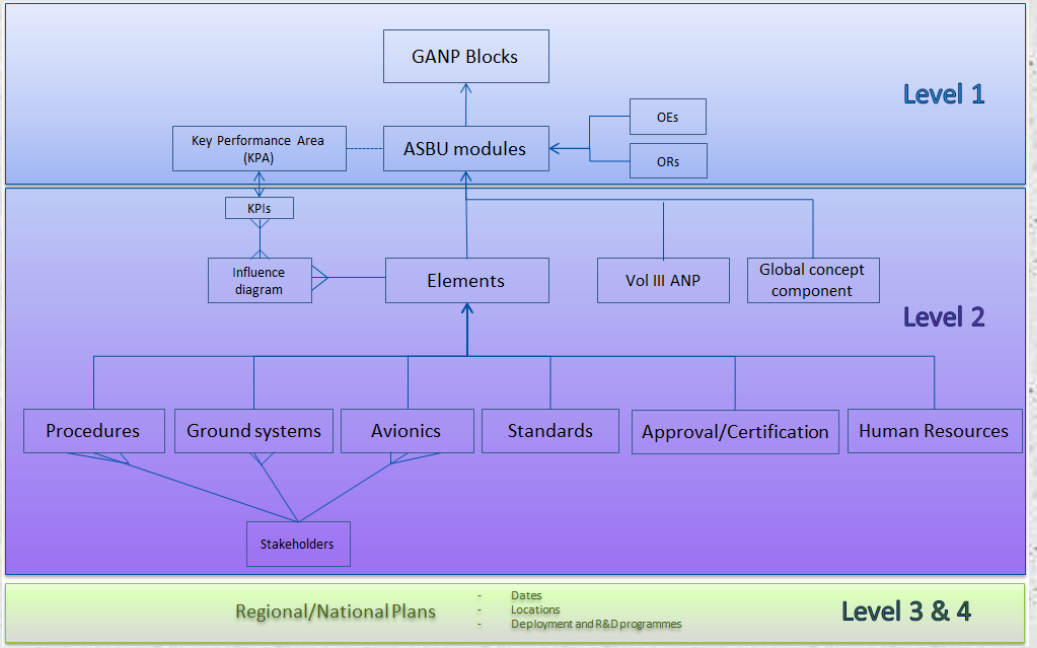
Example



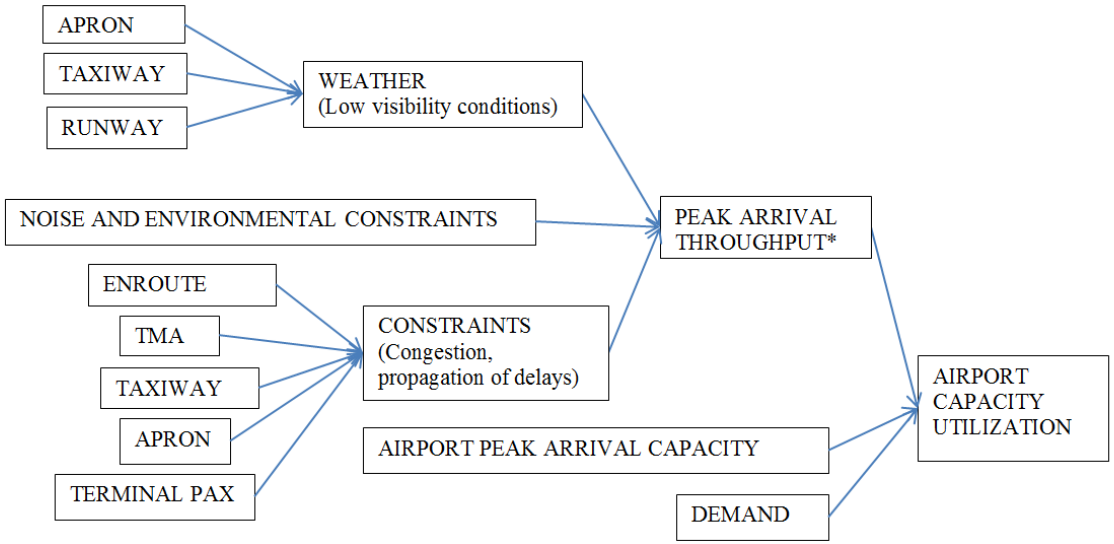
Example

- Associated Safety Assessment
- Associated Human Factors Assessment
- Associated Environmental Impact Assessment

STEP 3: IDENTIFICATION OPT. SOLUTION



Airport Arrival Capacity Utilization, airport arrival throughput (accommodated demand) compared to arrival capacity or demand, whichever is lower.

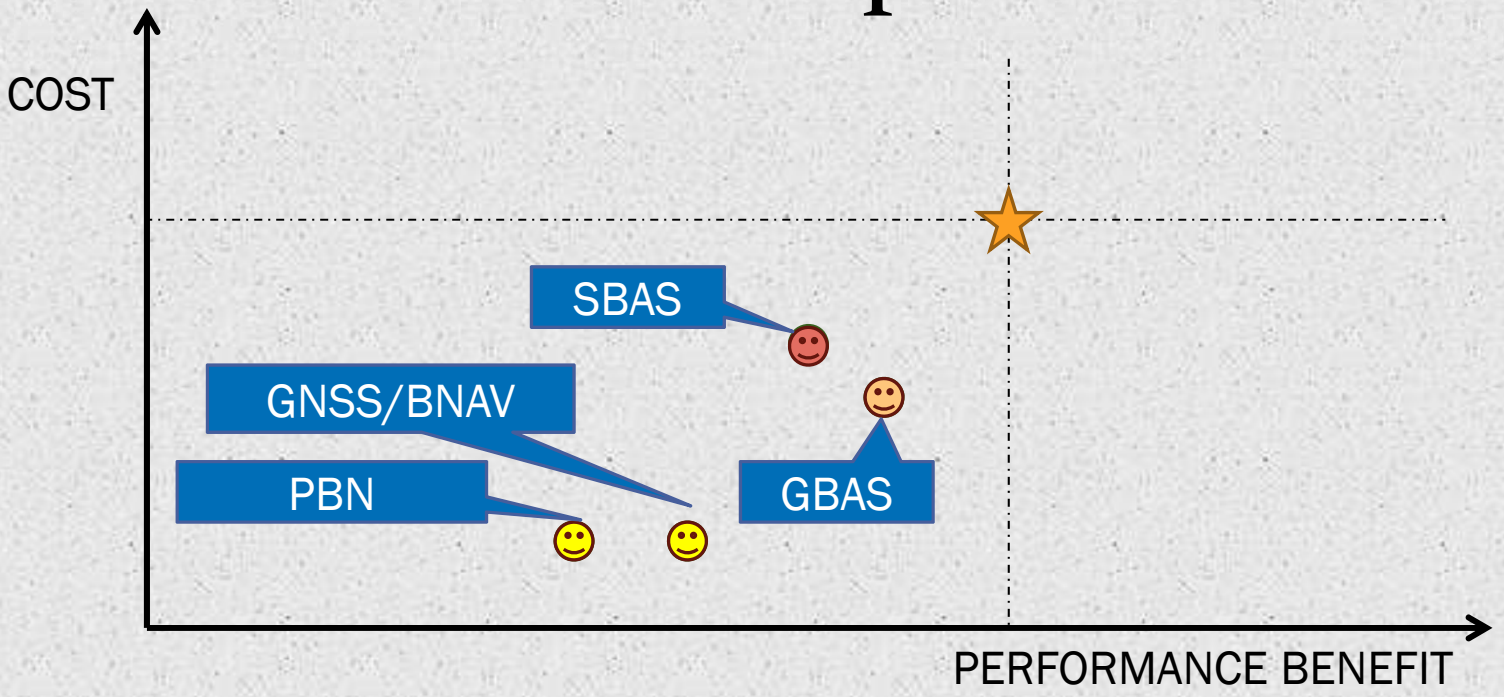


* The actual number of landings at an airport.

Example

- Weather
  - B0 APTA:
    - GNSS+ BaroVNAV
    - GNSS+GBAS
    - GNSS+SBAS
- Topography
  - B0 FRTO
    - Airspace design based on PBN

Example

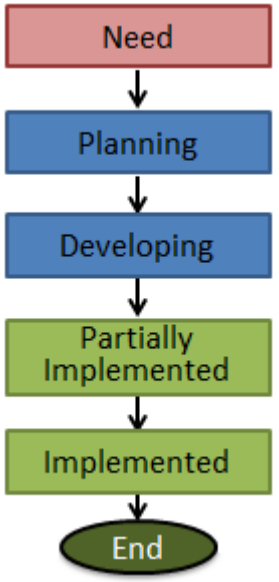


Example

- Associated Safety Assessment
- Associated Human Factors Assessment
- Associated Environmental Impact Assessment

STEP 4: DEPLOYMENT OF THE SOLUTION

- Execution phase
  - Planning
  - Implementation
    - National mechanism for tracking the implementation of the elements
  - Benefits



Example

- Enablers
- Responsible stakeholders for implementation
- Project Management
  - Monitor Progress on implementation: Mechanism for tracking implementation
- Deployment packages
  - Per element
  - Training, Seminars, WS, TA, SIP,…

STEP 5: ASSESSMENT OF RESULTS

- Continuously assess performance
- Monitor progress of implementation
- Review actually achieved performance
  - Update performance gaps

→ +(Step 1&2)=

PERFORMANCE MONITORING AND REVIEW

STEP 5: ASSESSMENT OF RESULTS

- Tasks in the PMR:
  - Data collection
  - Data publication
  - Data analysis
  - Formulation of conclusions; and
  - Formulation of recommendations.

STEP 5: ASSESSMENT OF RESULTS

- Data collection
  - Automatic Data Collection
  - Manual data reporting (electronic or paper)
- For each KPI:
  - information needs;
  - suppliers of data;
  - information disclosure by data suppliers; and
  - manage the data feeds on an ongoing basis.

STEP 5: ASSESSMENT OF RESULTS

- Data access and publication
  - Audience:
    - Performance specialists
      - Specific data (as much granularity as possible)
    - People with a generally high level interest in ATM performance
      - High-level performance indicator

STEP 5: ASSESSMENT OF RESULTS

- Data Analysis
  - Quality of the data
  - Data analysis
    - Big picture
    - Cause-effect analysis for results

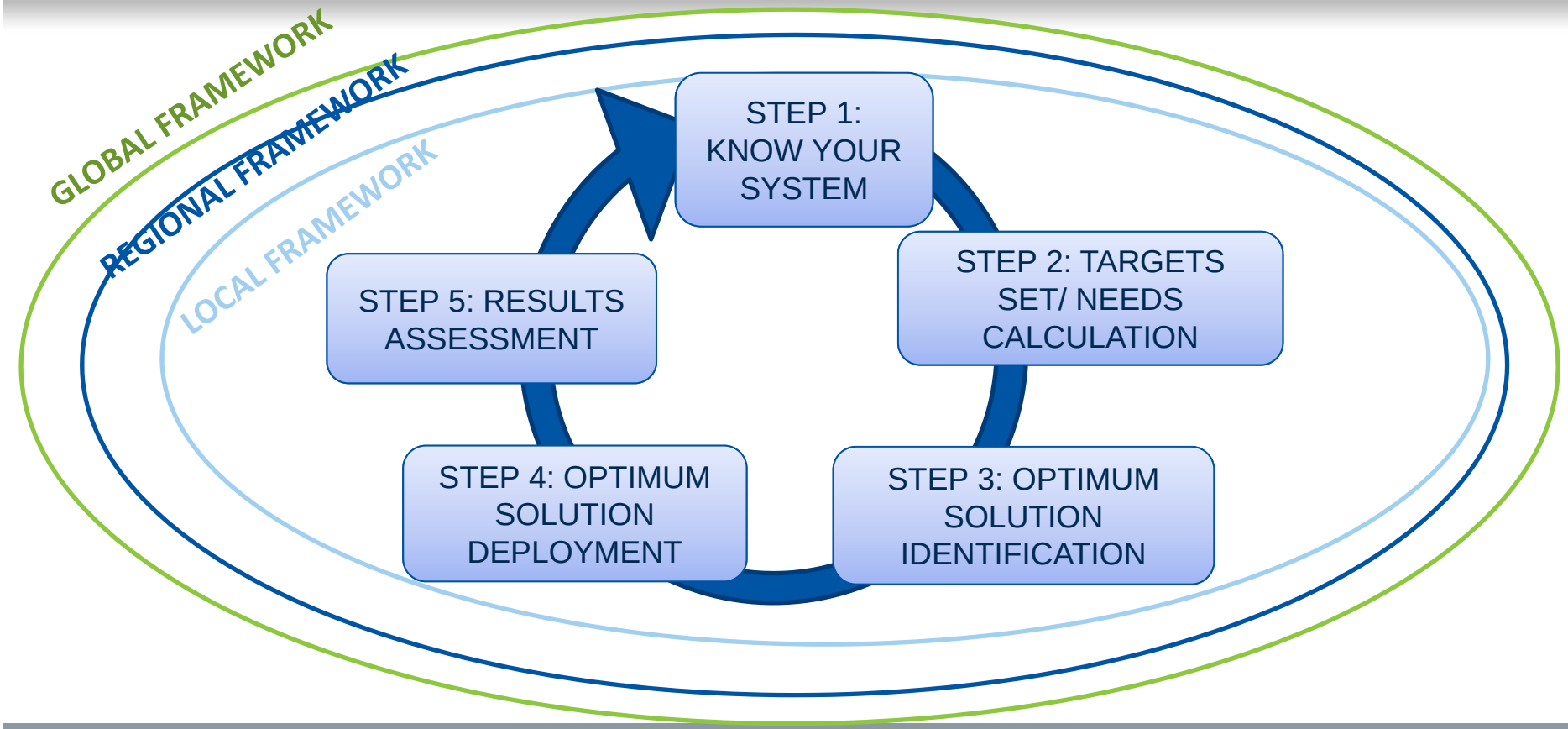
→New performance objectives, performance indicators and data needs.

STEP 5: ASSESSMENT OF RESULTS

- Formulation of conclusions
  - Performance objectives
- Formulation of recommendations
  - ATM community expectations

Example

- Data collection at a national level
- Report annual performance data to the PIRGs Objective: Monitor improvement performance of the system
  - Tool: ANRF/ Dashboards
  - ICAO to publish Air Navigation Report based on this data
  - ICAO to review global performance objectives base on the results
- Cycle to start again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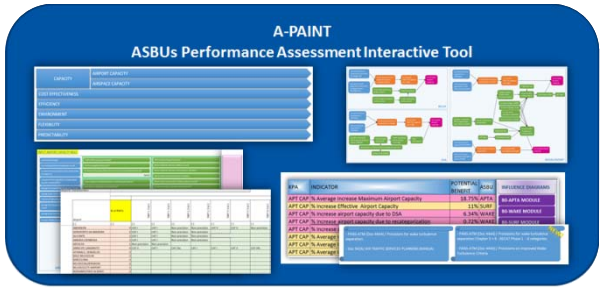
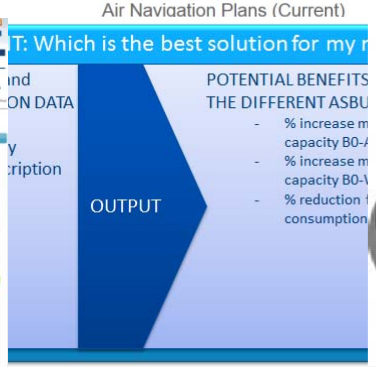
GLOBAL LEVEL FALL 2016



STATE LEVEL

REGIONAL LEVEL DEC 2015



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