

National Airway Plan

NATIONAL AIRWAY PLAN

PAN

2022 - 2052

NATIONAL CIVIL AVIATION SECRETARIAT



AVIATION IN BRAZIL

Brazil

Population: 212,6 Million

Country: 8,5 Million km²

27 states

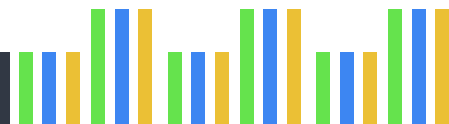
5,572 municipality

16 cities over 1 million inhabitants

Brazilian aviation

505 airports

3,350 private airfiels



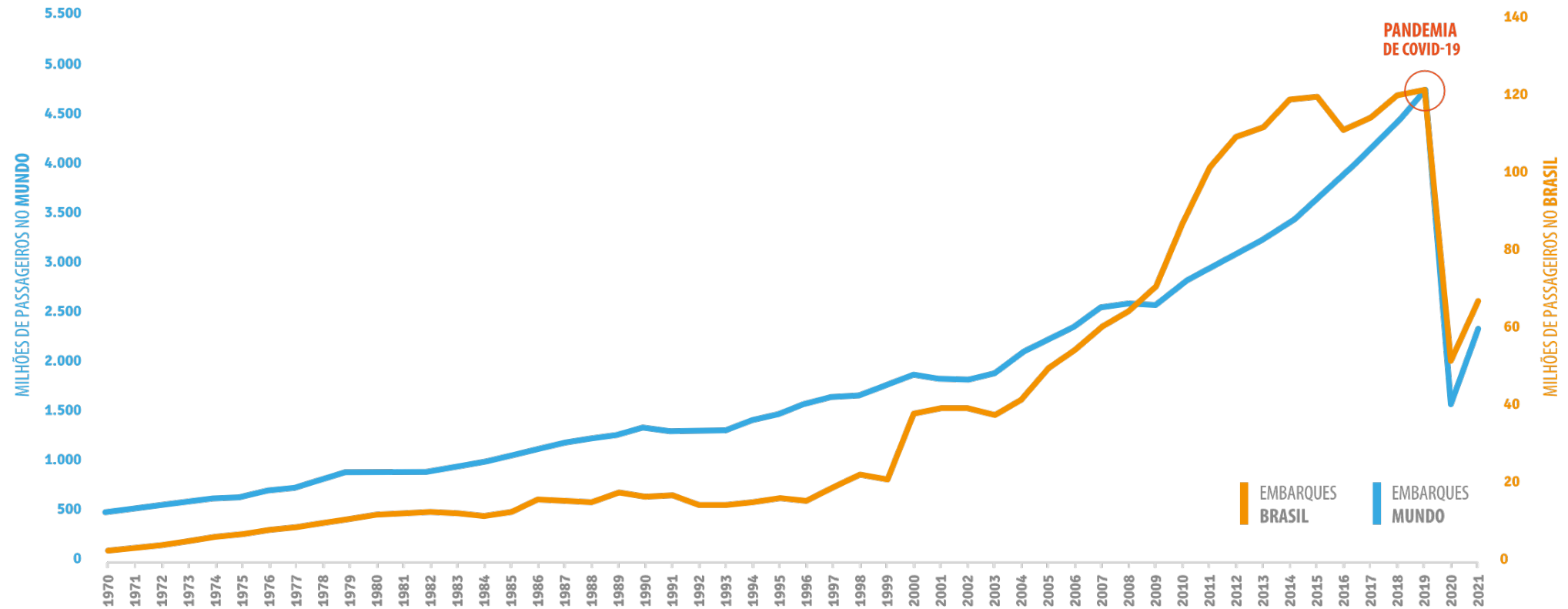


AVIATION IN BRAZIL

Historical Evolution of passengers – Brazil and World

EVOLUÇÃO HISTÓRICA DA AVIAÇÃO: BRASIL VS. MUNDO

EM MILHÕES DE PASSAGEIROS EMBARCADOS, 1970 - 2020





FEDERAL PLANNING

Integrated Long Term Plan – PILPI

30 years basis

Socioeconomic Viability

I - transportation →

II - telecommunications

III - energy

IV - mining

V - water resources and basic sanitation

VI - research and technological development

*Integrated
Transport Plan*

PNL 2035

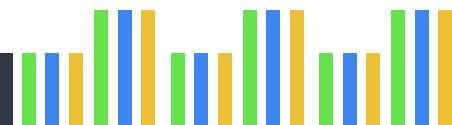
*Strategic
MINFRA*

*Terrestrial
PSTT*

*Waterway
PSH*

*Port
PSPORT*

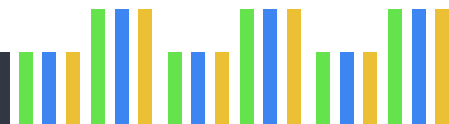
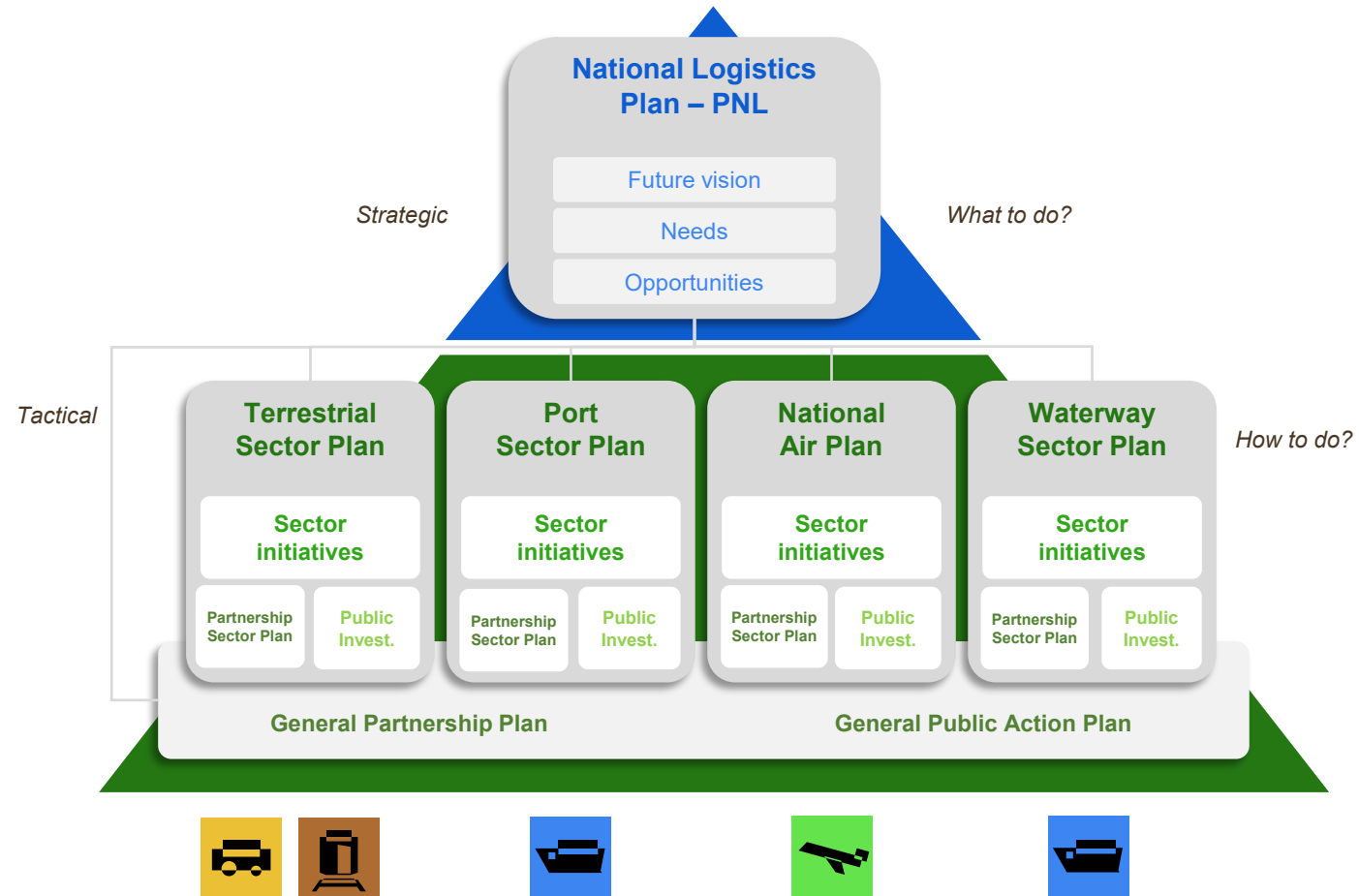
*Airway
PAN*





TRANSPORT PLANNING

Integrated Transport Planning - PIT

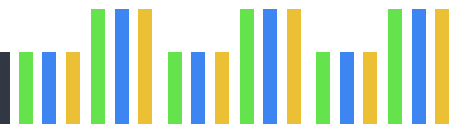




DEFINING SCOPE

NATIONAL AIRWAY PLAN

Excludes ANSP, Met Services, Aeronautical Charts, Information, Communitation, ATS, Search and rescue and Accident Investigation policies





TRANSPORT PLANNING

SOCIOECONOMIC EVALUATION

Cost-Benefit Analysis - CBA

Counterpart to the Financial Analysis of Projects
NPV - Net Present Value

Social impact of project

Methodology for project comparison

Takes into account social costs and benefits (including environmental and social externalities) at parameterized social prices;

Estimates social opportunity cost;

Excludes sunk costs, depreciation, and financial charges;

Applies the Social Discount Rate - TSD

Δ NSPV - Net Social Present Value

What is measured?

CAPEX e OPEX

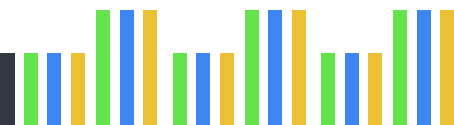
Noise impact

Cost of greenhouse gases (GHG)

Transportation cost (pax and cargo)

Value of time (pax)

Value of life (safety)

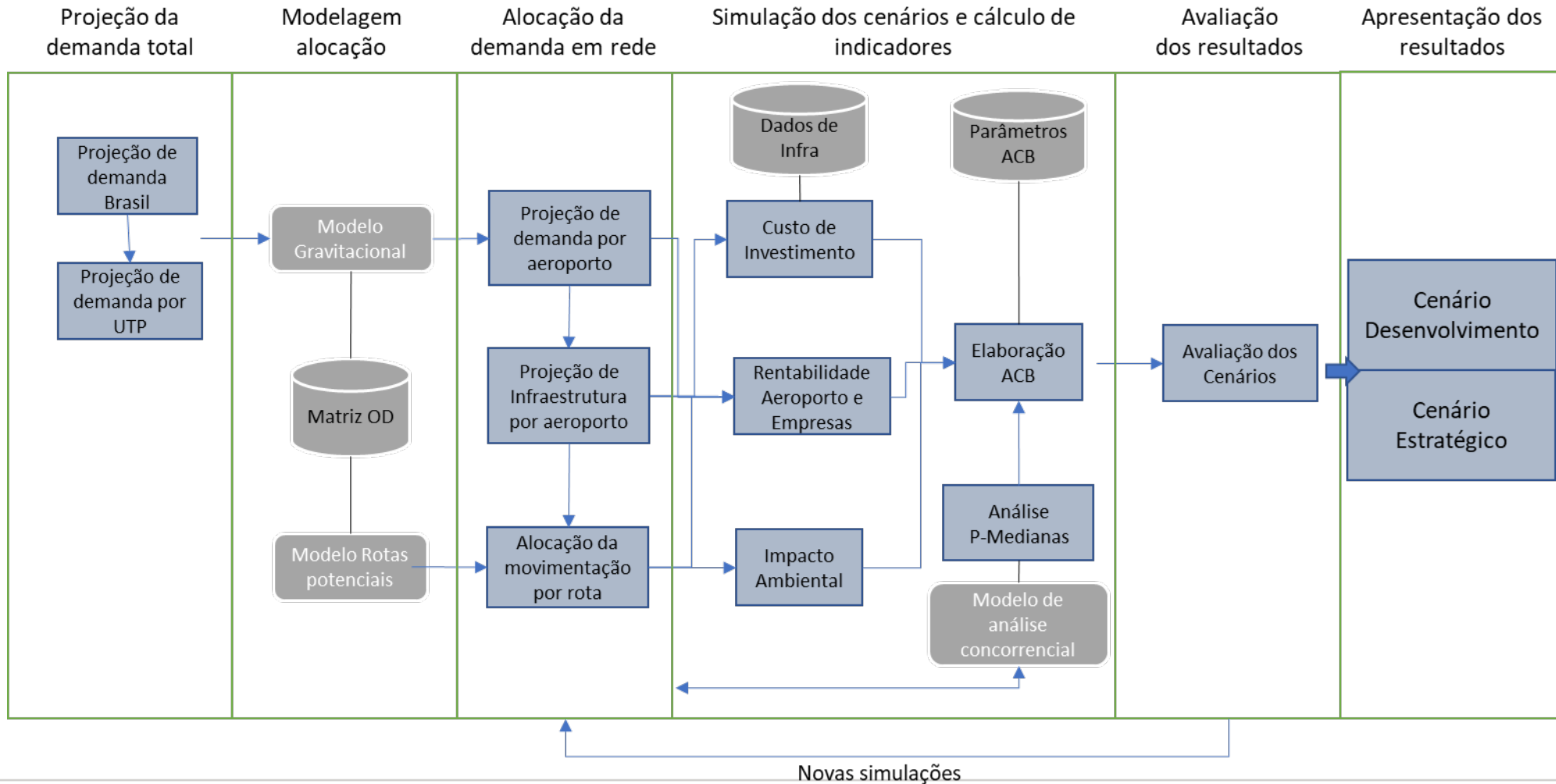




NATIONAL AIRWAY PLAN

METHODOLOGY OVERVIEW

CHOOSING THE BEST NETWORK





NATIONAL AIRWAY PLAN

DEMAND FORECASTING

National

*Top-Down
GDP by Federal Decree
30 years*

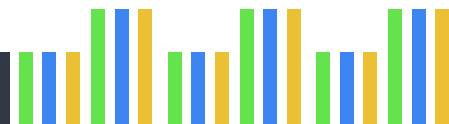
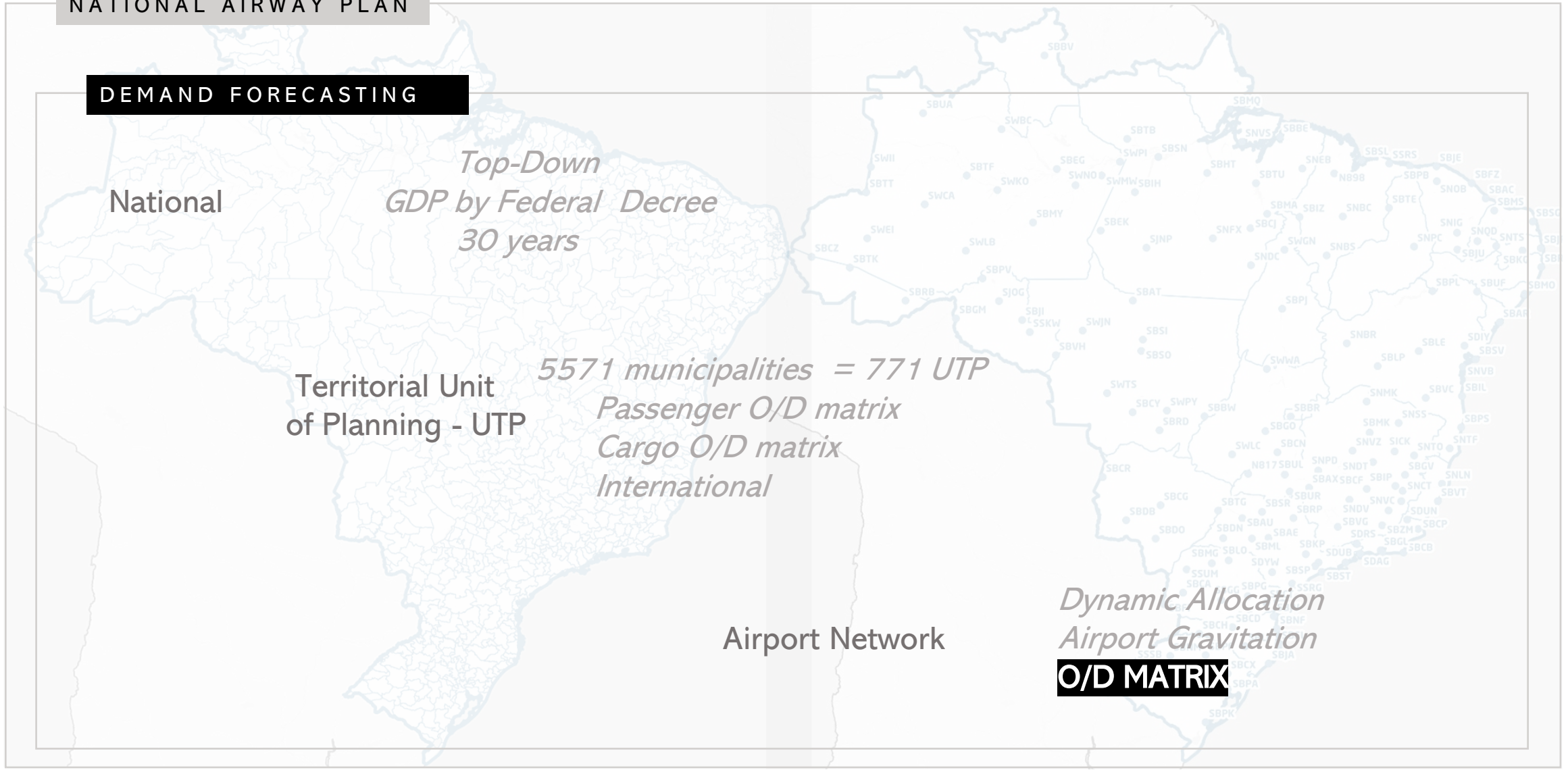
Territorial Unit
of Planning - UTP

*5571 municipalities = 771 UTP
Passenger O/D matrix
Cargo O/D matrix
International*

Airport Network

*Dynamic Allocation
Airport Gravitation*

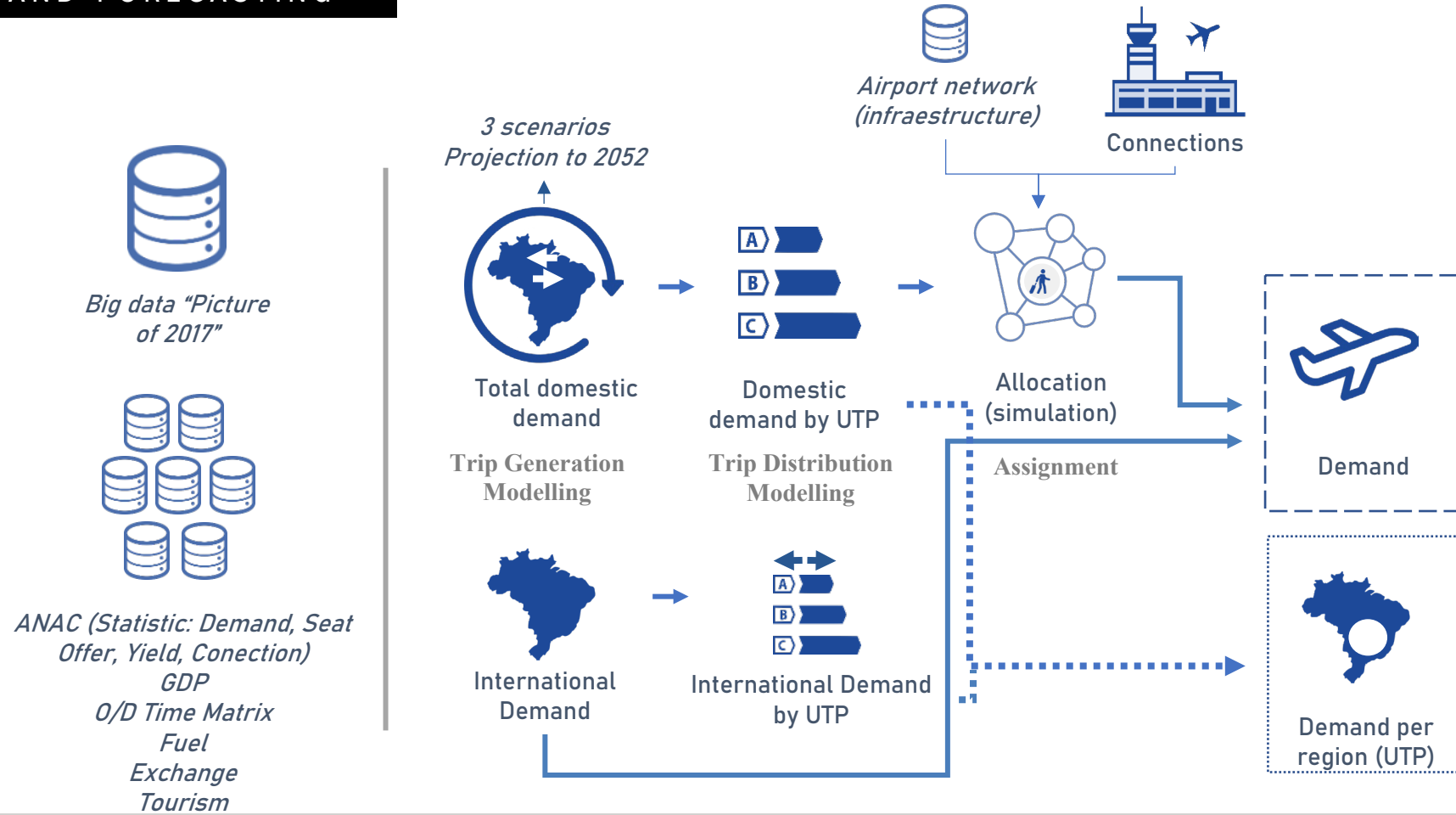
O/D MATRIX





NATIONAL AIRWAY PLAN

DEMAND FORECASTING





NATIONAL AIRWAY PLAN

O/D MATRIX

Cellphone displacement in Brazil

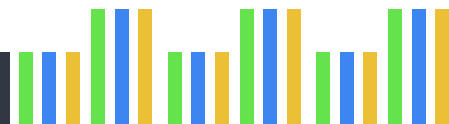
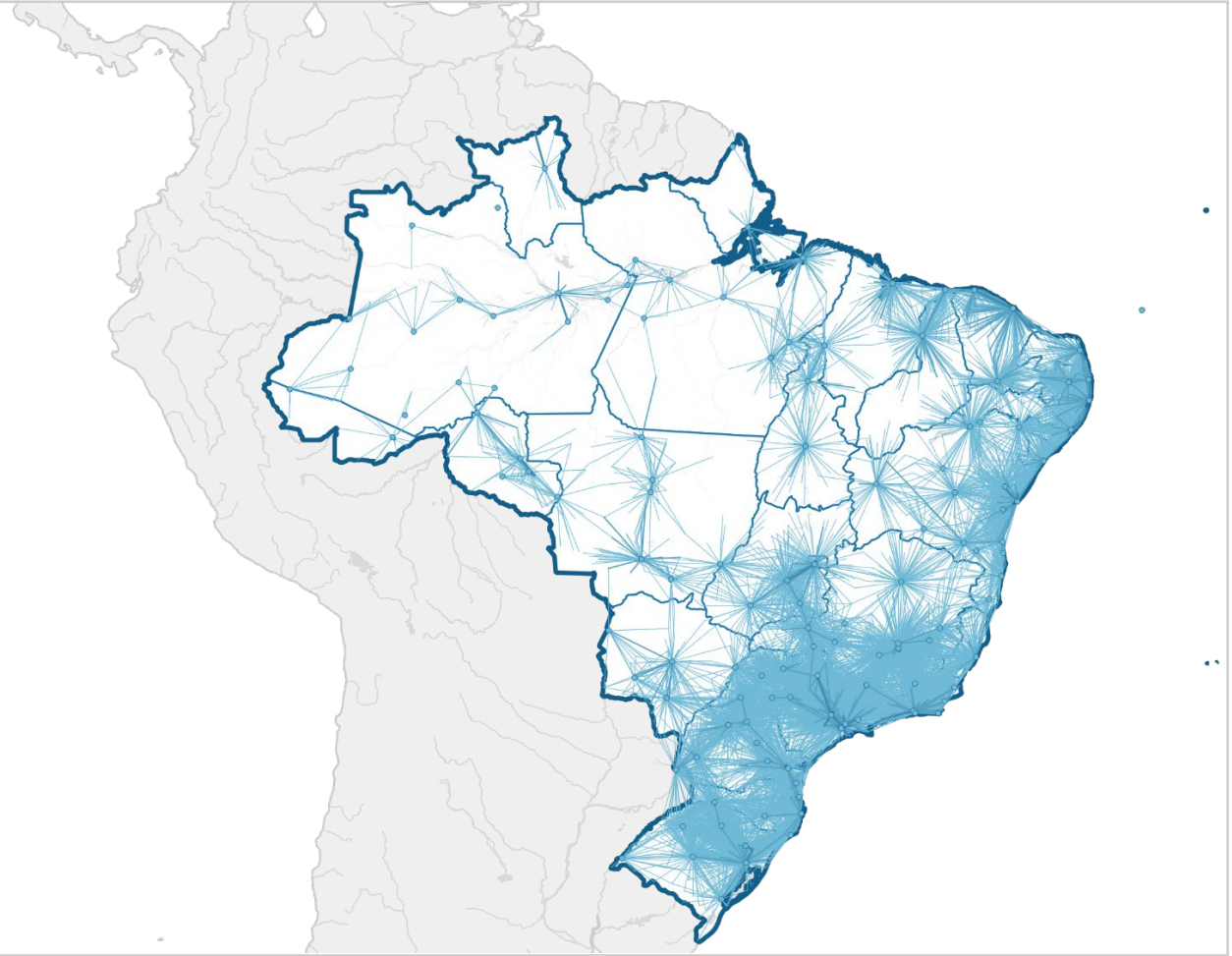
Year: 2017

Air and non-air displacement

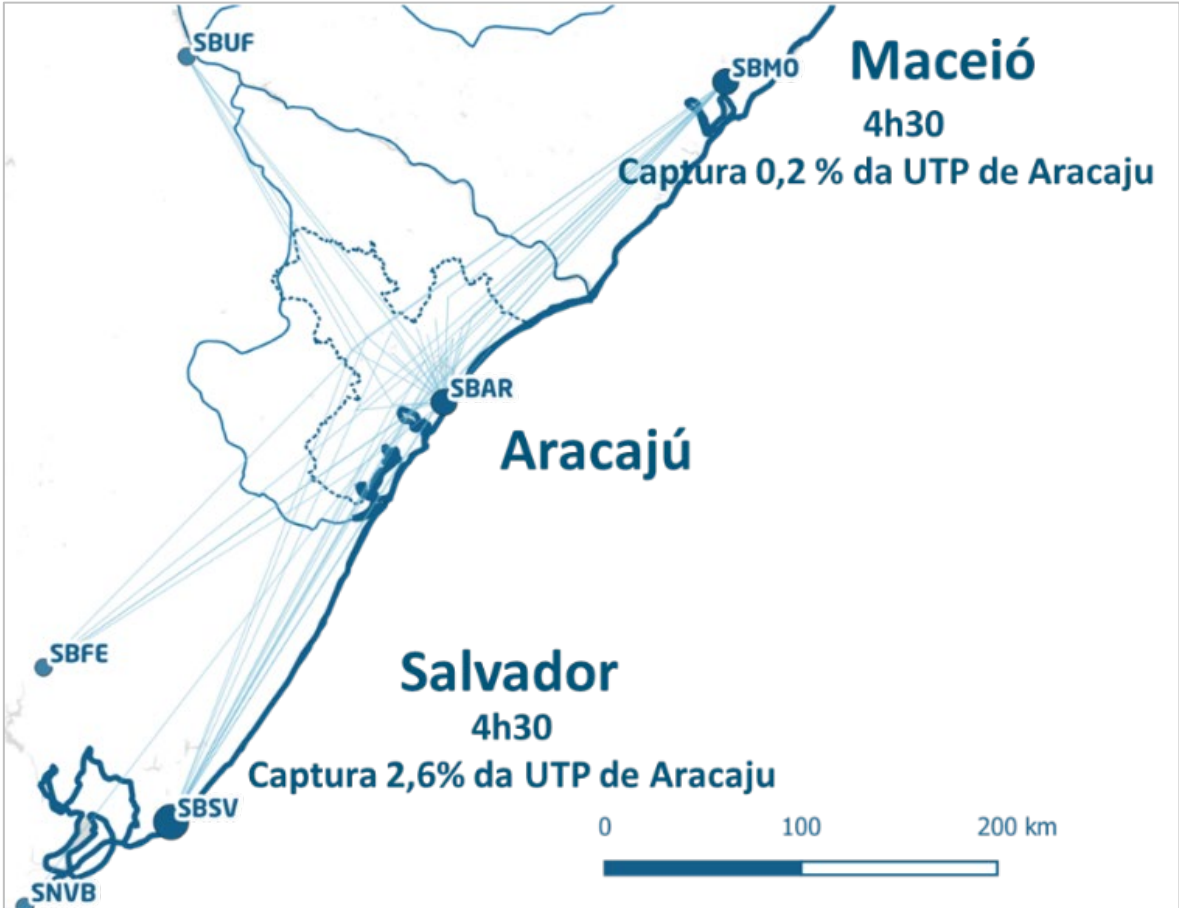
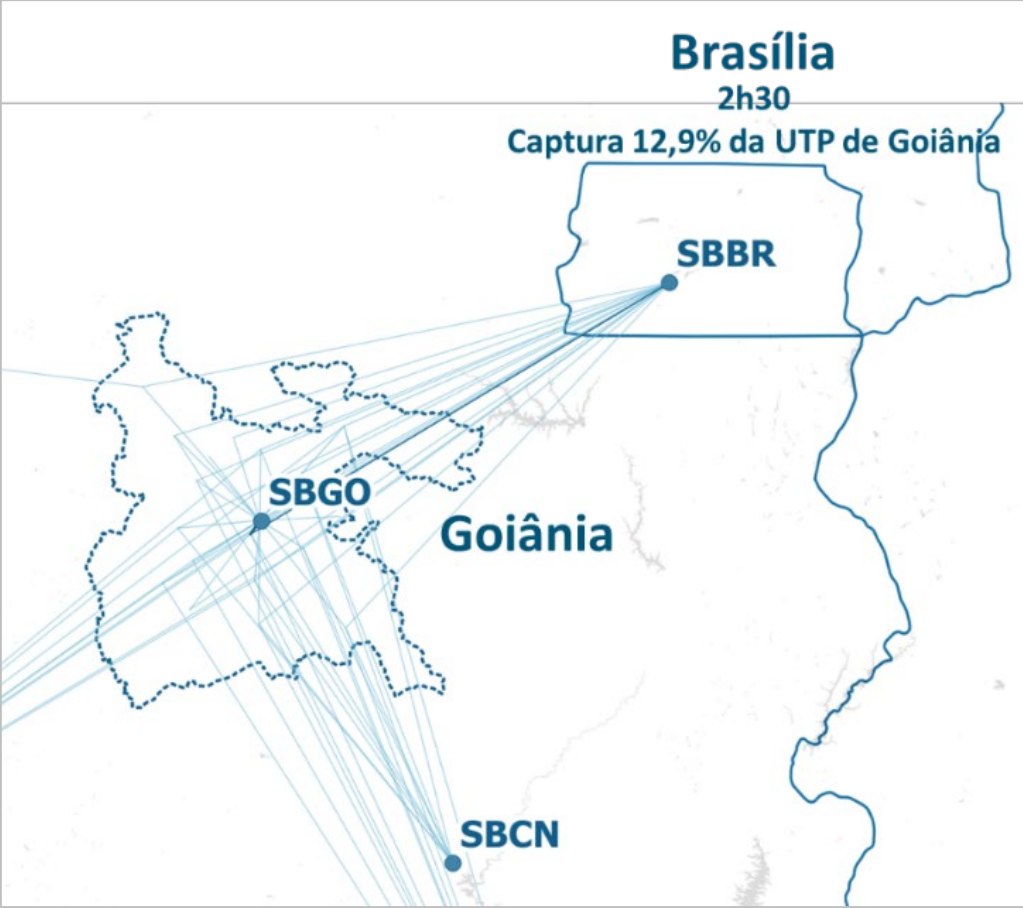
- Air: 74 million
- Non-air: 1,8 billion

Real catchment area

Real O/D interest



Catchment area insights – Gravity Demand



Código	UTP	Tarifa média	Yield Aeroporto	Passageiros embarcados	Partidas	Empresas operadoras	Destinos
SBBR	Brasília	R\$ 399,18	0,3915474	8.402.576	63.771	21	63
SBGO	Goiânia	R\$ 430,38	0,4466845	1.593.549	15.267	7	26

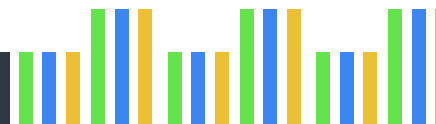
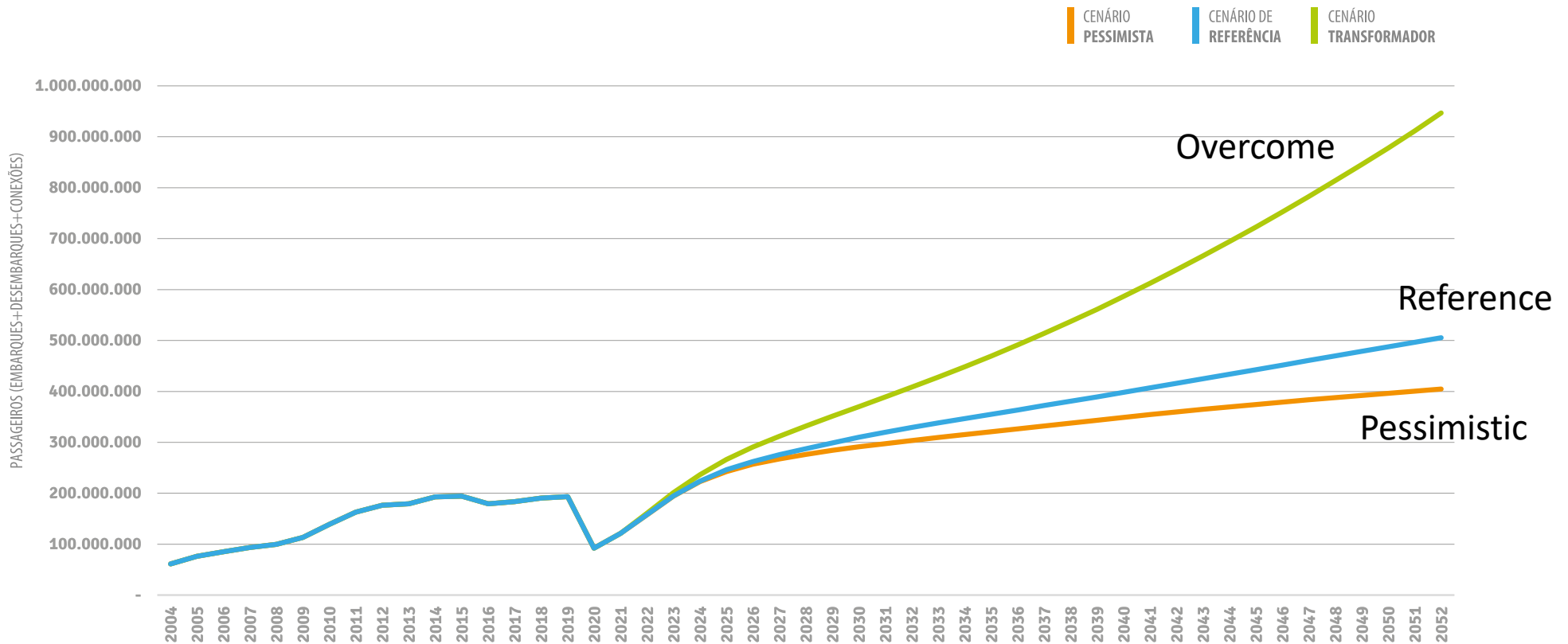
Código	UTP	Tarifa média	Yield Aeroporto	Passageiros embarcados	Partidas	Empresas operadoras	Destinos
SBSV	Salvador	R\$ 459,66	0,5879	3.774.232	29.409	8	29
SBMO	Maceió	R\$ 656,78	0,5638	1.086.402	7.631	5	20
SBAR	Aracaju	R\$ 528,03	0,4097	613.872	4.764	5	10



NATIONAL AIRWAY PLAN

DEMAND FORECAST

Demand forecast – Domestic Passengers processed





NATIONAL AIRWAY PLAN

DEVELOPED DATABASES

Aerodrome Portfolio

941 enterprises
At least 1 per UTP
Survey of current infrastructure situation

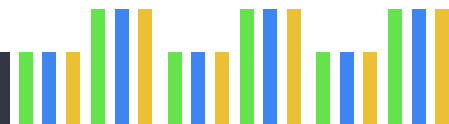
Fleet Aircraft

Capacity
Load factor
Reach
Speed
Fuel consumption
Emissions

Potential Routes

O/D MATRIX

Historical database
Volume
Distance and time





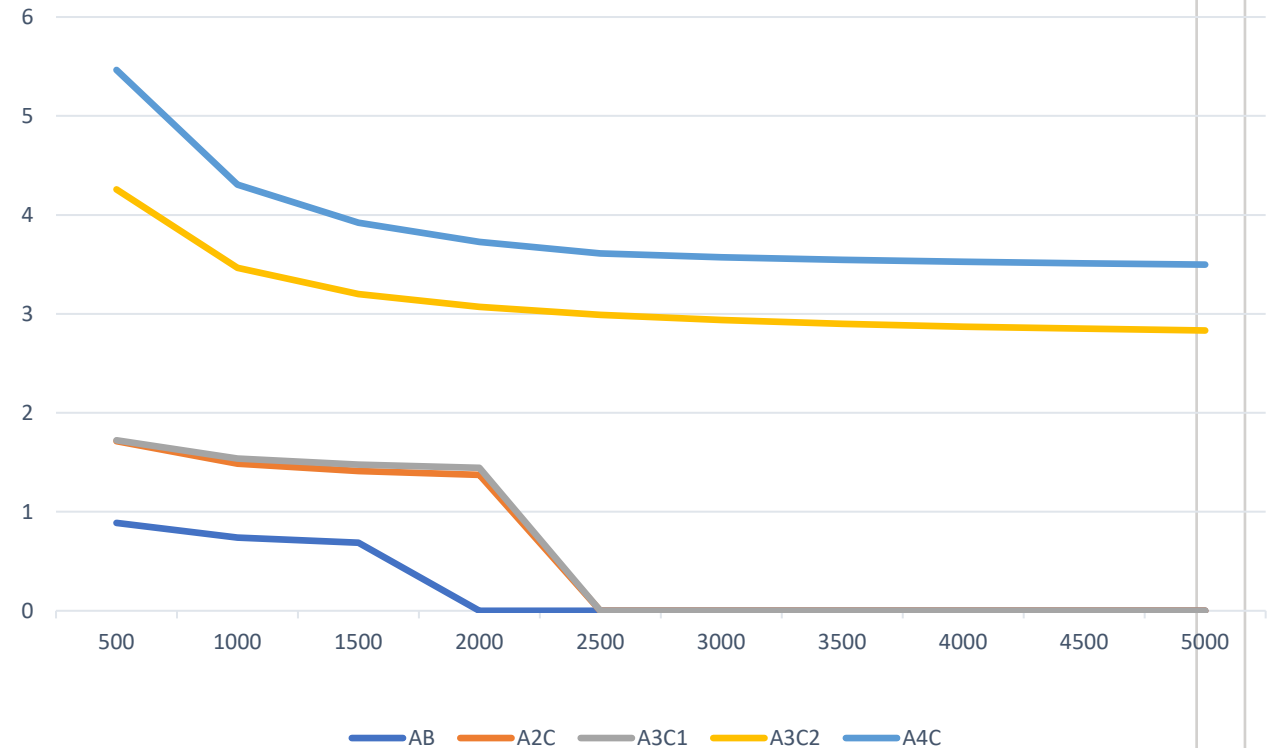
NATIONAL AIRWAY PLAN

DEMAND FORCAST

AIRPORT INFRAESTRUCTURE STANDARDS

ICAO	ACFT CODE	MTOW	maxSPEED	maxRANGE	seats
C208	1B	3629	296	1.667,00	9
AT45	2C	18600	556	3.259,52	42
AT44	2C	17900	482		42
AT43	2C	16700	472	5.094,85	42
AT75	3C1	23000	519	1.653,84	72
AT72	3C1	21500	509	2.222,40	72
A318	3C2	59000	852	6.959,82	107
E190	3C2	45995	852	8.519,20	114
A319	3C2	64000	833	6.945,00	124
E195	3C2	52290	828	8.519,20	124
B737	3C2	66320	852	6.691,65	128
B733	3C2	56470	795	6.574,60	128
B738	4C	70530	852	5.569,94	162
A320	4C	73900	833	5.663,42	180

QaV/km por classe de equipamento

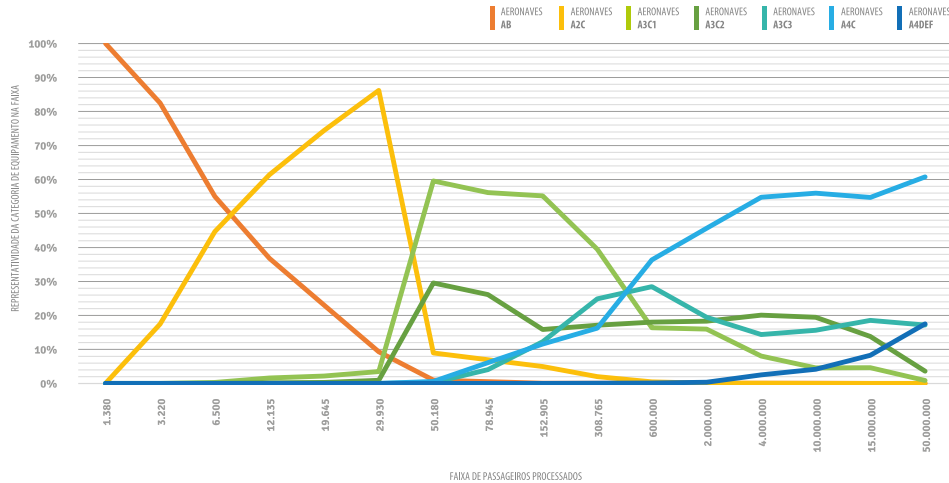




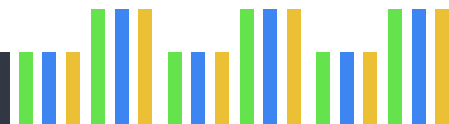
NATIONAL AIRWAY PLAN

AIRPORT INFRASTRUCTURE STANDARDS

MIX DE CÓDIGO DE AERONAVE POR FAIXA DE PASSAGEIROS
 REPRESENTATIVIDADE DE CADA GRUPO DE EQUIPAMENTOS POR FAIXA DE PASSAGEIROS ANUAL



Reference for investments
Aircraft mix by airport
Function of passengers processed
Load factor by mix of aircraft
Critical aircraft

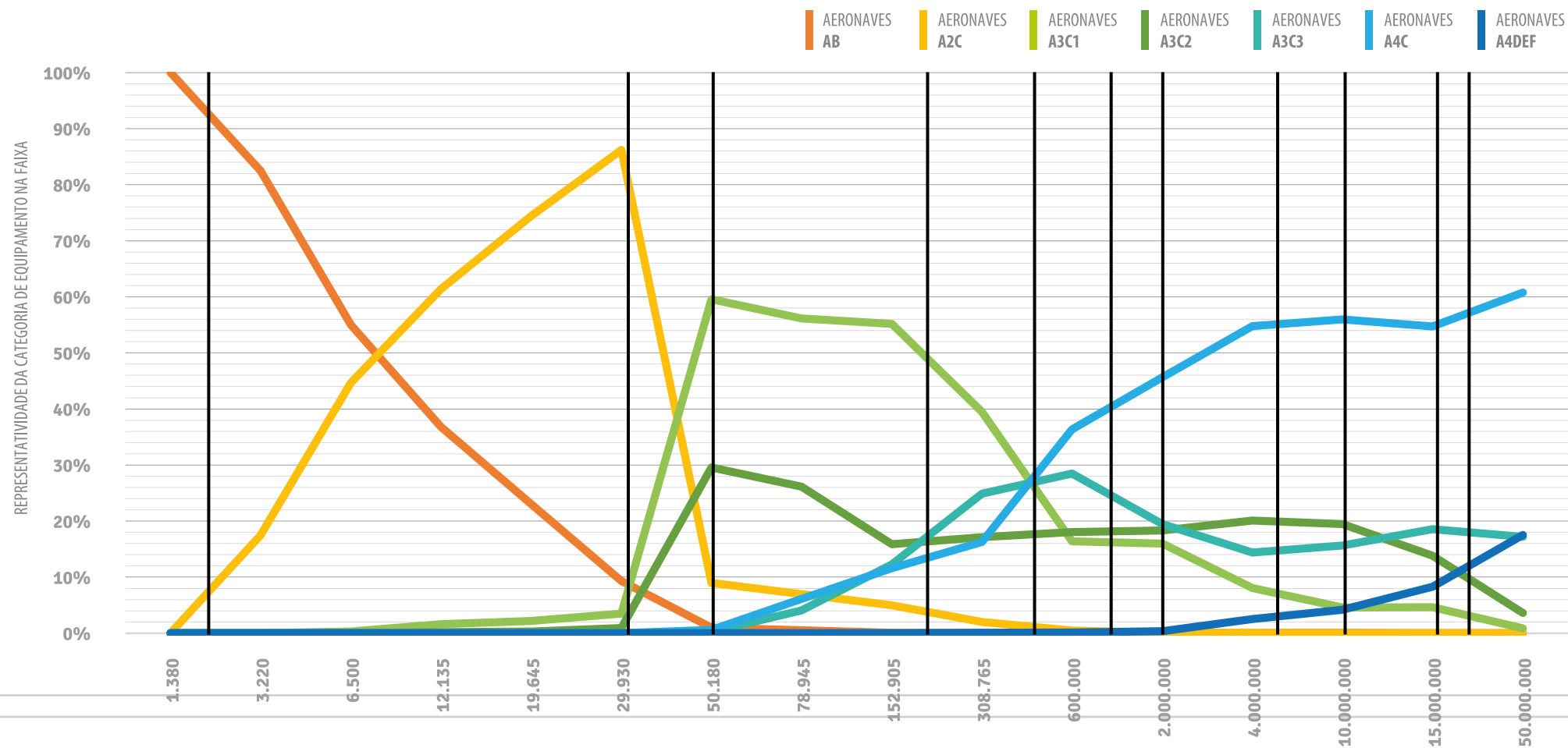




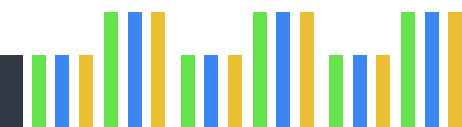
NATIONAL AIRWAY PLAN

MIX DE CÓDIGO DE AERONAVE POR FAIXA DE PASSAGEIROS

BEHAVIOUR OF AIRCRAFT MIX
REPRESENTATIVITY OF EACH GROUP OF EQUIPMENTS FOR FAIXA DE PASSAGEIROS ANUAL



FAIXA DE PASSAGEIROS PROCESSADOS



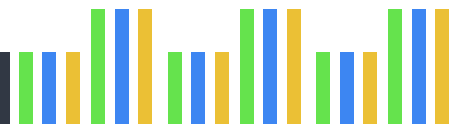


NATIONAL AIRWAY PLAN

AIRPORT INFRASTRUCTURE STANDARDS

		Standard GABA	Standard 1	Standard 2	Standard 3	Standard 4	Standard 5	Standard 6	Standard 7	Standard 8	Standard 9	Standard 10
Annual passenger	Min		2.000	30.001	50.001	200.001	500.001	1.000.001	2.000.001	5.000.001	10.000.001	15.000.001
	Max	2.000	30.000	50.000	200.000	500.000	1.000.000	2.000.000	5.000.000	10.000.000	15.000.000	20.000.000
Critical Aircrafts		C208	AT72	AT72	3C (E295 / A20N / B738)	4C (B38M / A320)	4C (B38M / A320)	A321	A333	A339	A359	B77W
Seats		9	70	70	130	180	180	220	250	300	330	350

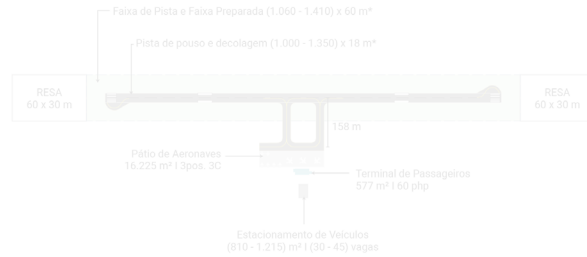
Mandatory safety elements for Airport Certification process
Critical Aircraft and Aircraft Mix by Passenger Processing
Airport Capacity
33 parameters Airport Infrastructure
6 parameters Aeronautical Infrastructure



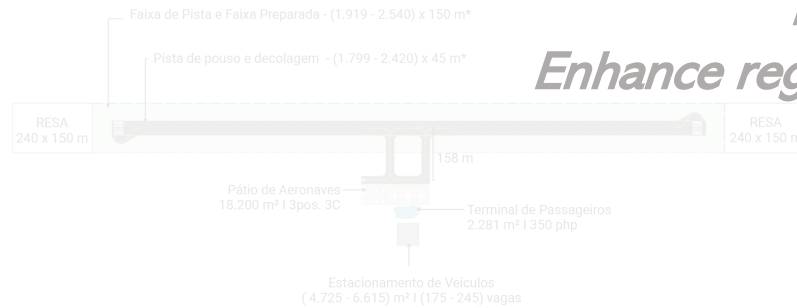


NATIONAL AIRWAY PLAN

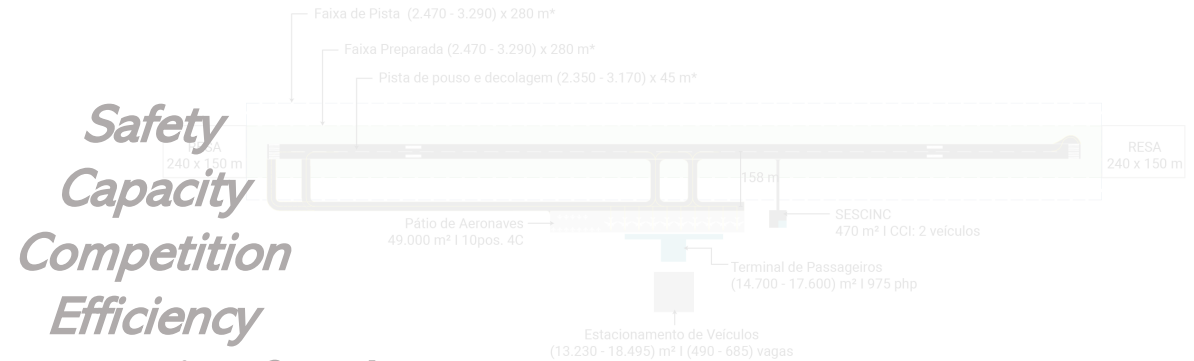
AIRPORT INFRASTRUCTURE STANDARDS



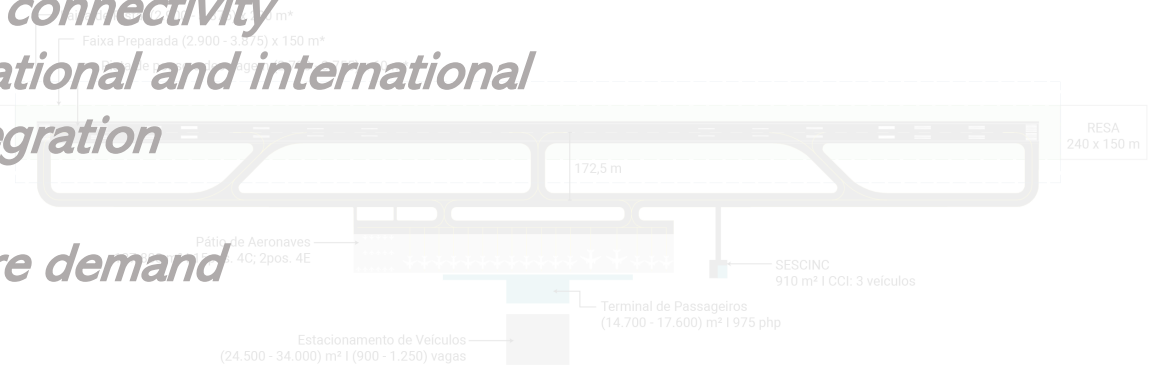
Standard GABA



Standard 3

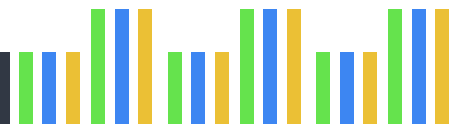


Standard 6



Standard 7

Safety
Capacity
Competition
Efficiency
Enhance gain of scale
Enhance connectivity
Enhance regional, national and international integration
Capture demand



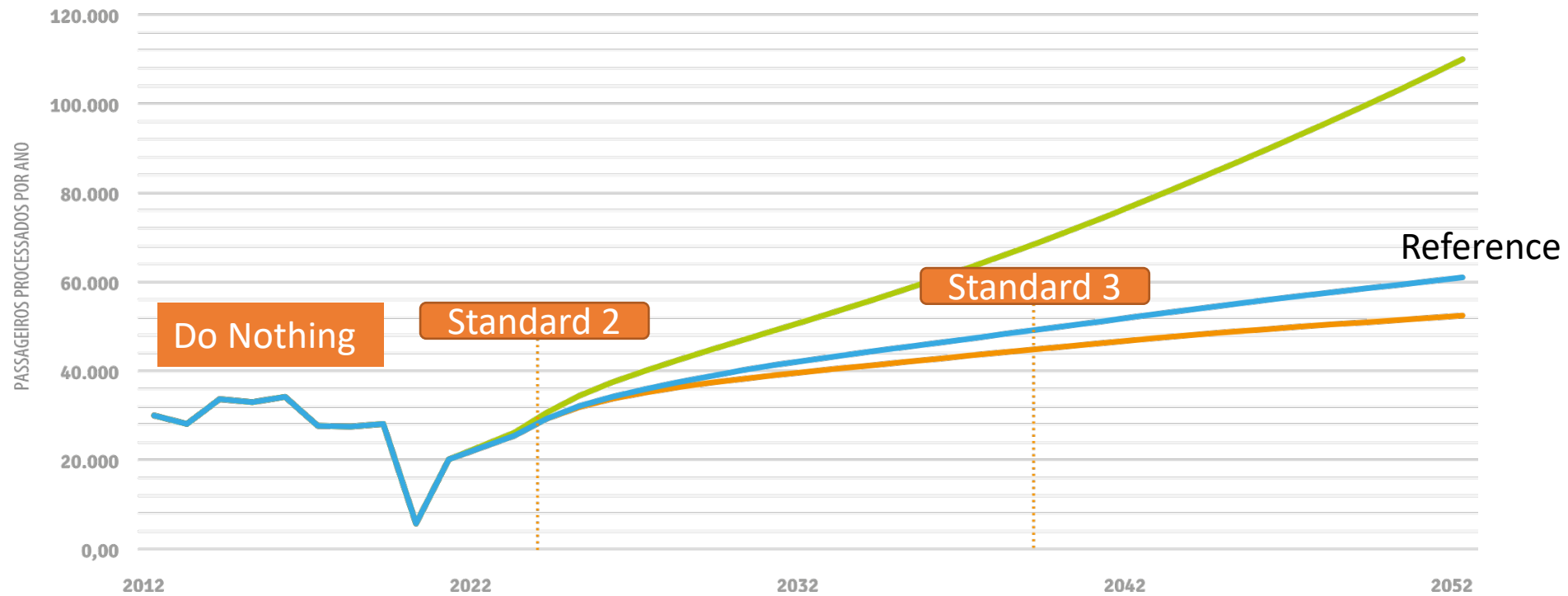


NATIONAL AIRWAY PLAN

DEMAND FORECAST

AIRPORT INFRASTRUCTURE STANDARDS

Infraestructure trigger in demand forecast – Airport Evaluation





NATIONAL AIRWAY PLAN

DEMAND FORECAST

AIRPORT INFRAESTRUCTURE STANDARDS

CAPEX Simulator

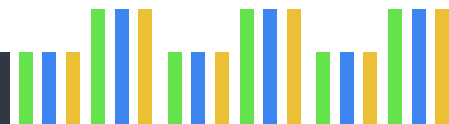
Demand Forecast at Reference scenario x
Current data of aerodrome x
Reference Airport Standards

CAPEX Cost for adaptations
(immediate)
Capex Cost per trigger
(year in future)

NPV & NPSV

OPEX and Operational
Revenues Simulator

Maintenance and operational costs
Aircraft Mix - Scheduled flights and GABA
Updated costs per state
Passengers forecast demand captured
Values per year

NPV & NPSV**NPSV - Revenues not used**



NATIONAL AIRWAY PLAN

DEMAND FORCAST

AIRPORT INFRAESTRUCTURE STANDARDS

Noise Simulator

- *Negative externalities with airport*
- *Population under aircraft noise*
- *Noise behavior among time*
- *Population growth*

Noise curve x

Population at micro-region

NPSV





NATIONAL AIRWAY PLAN

DEMAND FORECAST

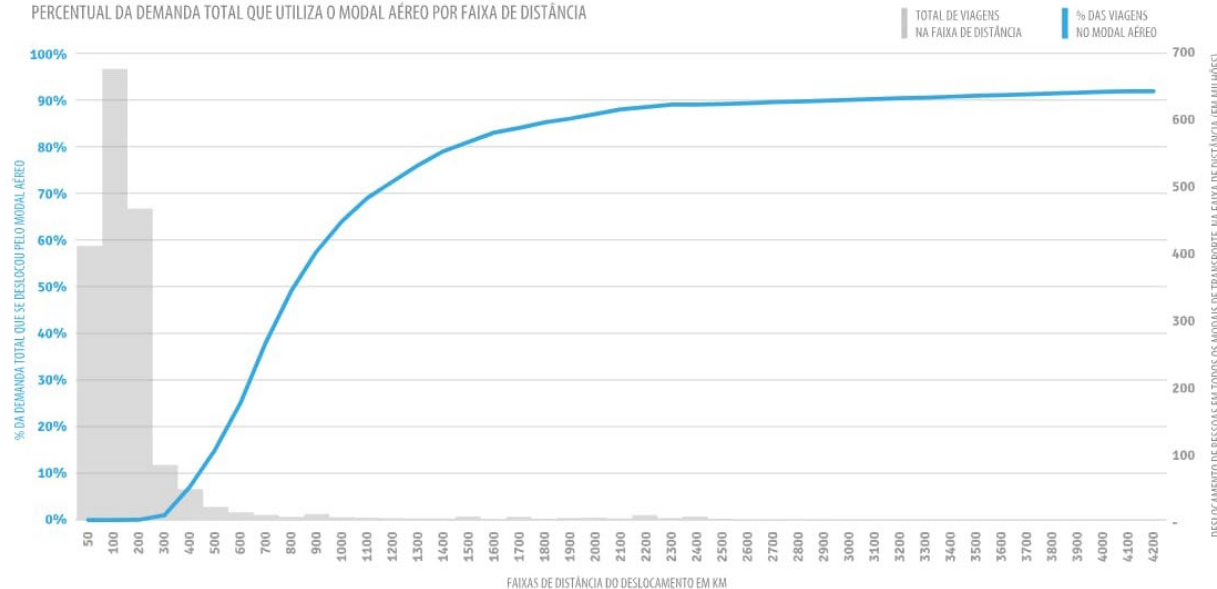
AIRPORT INFRASTRUCTURE STANDARDS

Route Simulator

*Critical Aircraft and Aircraft Mix
Processed Passengers Demand x
Capacity and Load factor*

*Reach
Capture demand*
O/D MATRIX

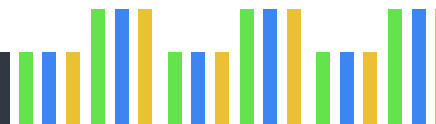
INFLUÊNCIA DA DISTÂNCIA NA ESCOLHA DO MODAL AÉREO
PERCENTUAL DA DEMANDA TOTAL QUE UTILIZA O MODAL AÉREO POR FAIXA DE DISTÂNCIA



Output Data

NPSV

ASK/RPK
Emissions
Air transport costs
Air transport time
Demand per route





NATIONAL AIRWAY PLAN

DEMAND FORECAST

BASE SCENARIO

Do nothing

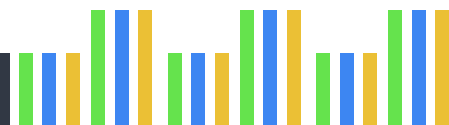
Finish what has started and allocated budget

“most likely scenario in the absence of the project, also called counterfactual scenario”

Scheduled flights – above 2,000 passengers; more than 2 Years

2022 – 123 airports

2024 – 130 airports with scheduled flights



BASE SCENARIO





NATIONAL AIRWAY PLAN

DEVELOPEMENT

HUNTING BEST SCENARIO

Initial assessment (123 airports at base scenario):

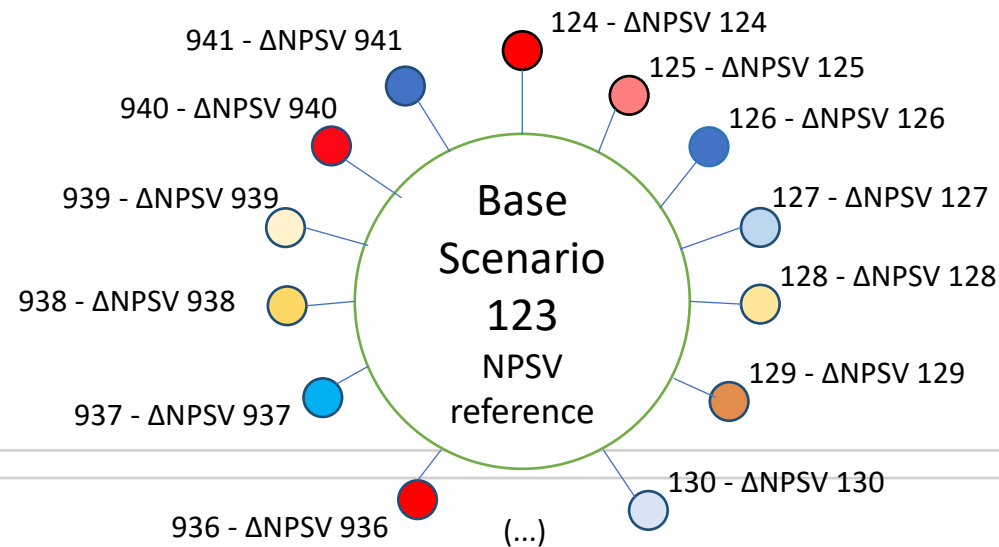
Base scenario airport network + each one of the 818 airports.

In this format, the 124th airport behaves without competitors, representing the maximum capture of demand and the highest ΔNPSV - Maximum Scenario

Airports that already have a negative ΔNPSV in this scenario have been discarded

VSPL

- <-1BB
- -200MM a -500MM
- -100MM a -200MM
- -50MM a -100MM
- -1 a -50MM
- CENÁRIO BASE
- 1 a 50MM
- 50MM a 100MM
- 100MM a 200MM
- 200MM a 500MM
- >1BB



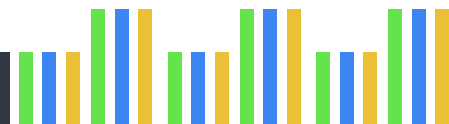
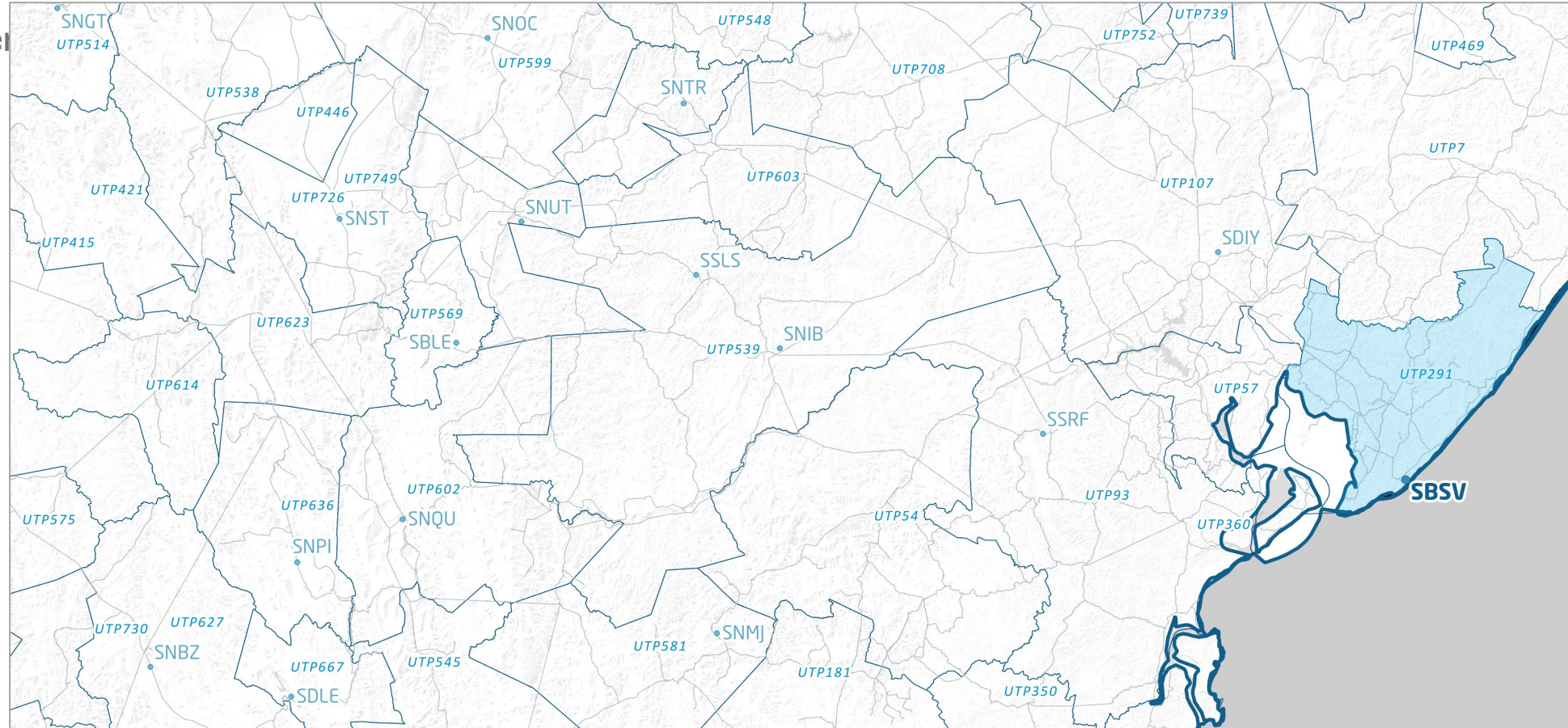


NATIONAL AIRWAY PLAN

COST-BENEFIT ANALYSIS SIMULATOR

SIMULATION

When

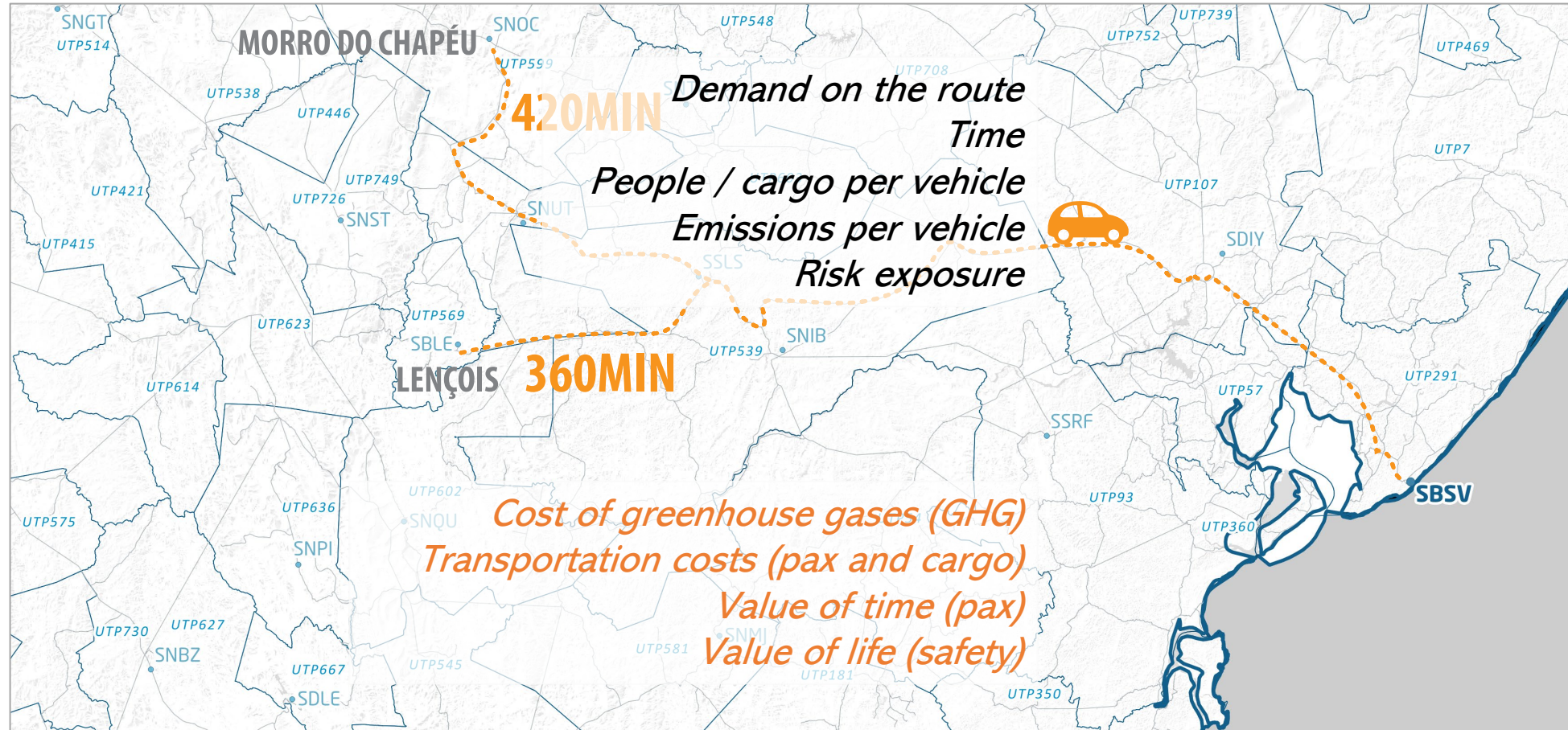




PLANEJAMENTO DE TRANSPORTES

COST-BENEFIT ANALYSIS SIMULATOR

BASE SCENARIO

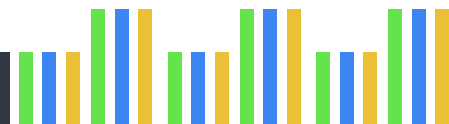
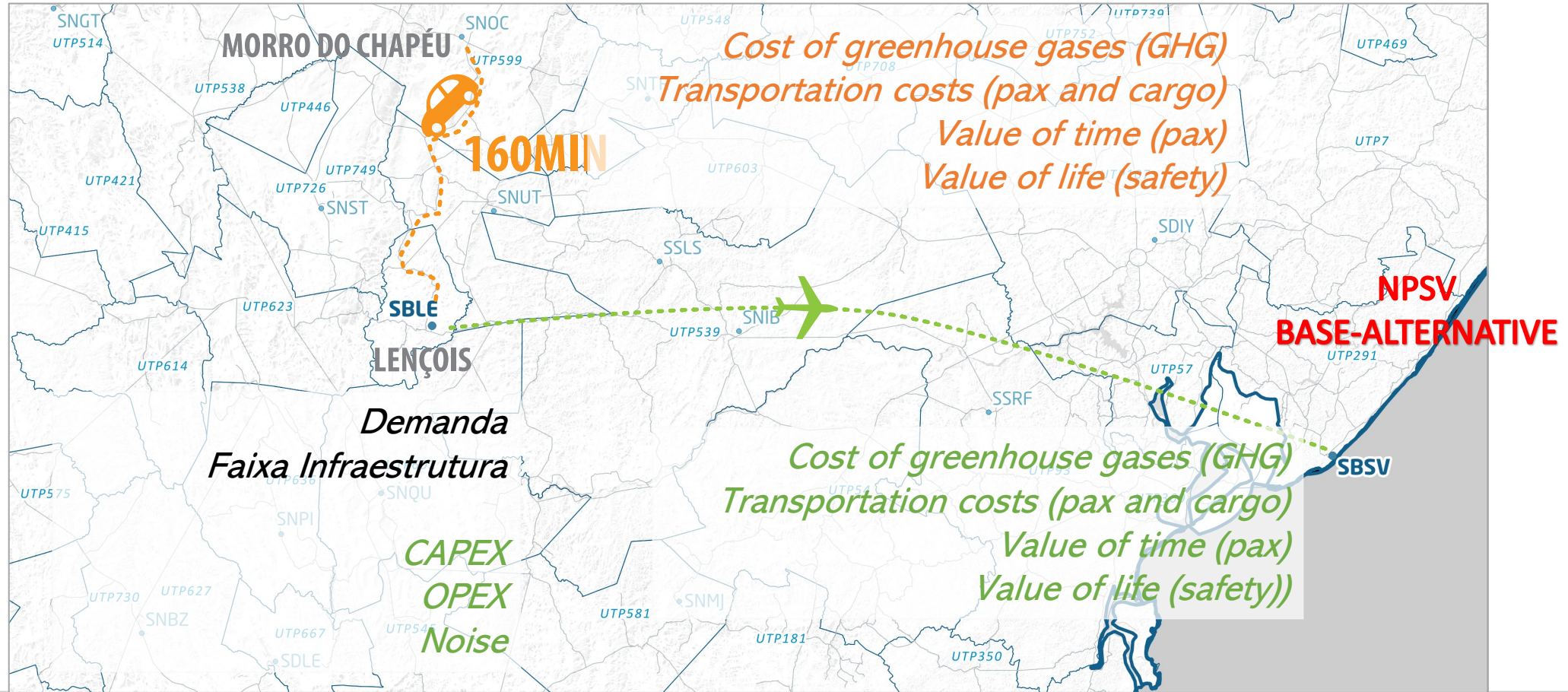




PLANEJAMENTO DE TRANSPORTES

COST-BENEFIT ANALYSIS SIMULATOR

ALTERNATIVE SCENARIO – LENÇÓIS AIRPORT





PLANEJAMENTO DE TRANSPORTES

COST-BENEFIT ANALYSIS SIMULATOR

CENÁRIO DESENVOLVIMENTO

Tools LOGIT

Base Scenario
(Cenário 0)

Alternative Scenario 1

Alternative Scenario 2

Alternative Scenario n

Simulating
demand in the
years of the
planning
horizonCalculation of
costs and
benefits in the
years of the
planning
horizon

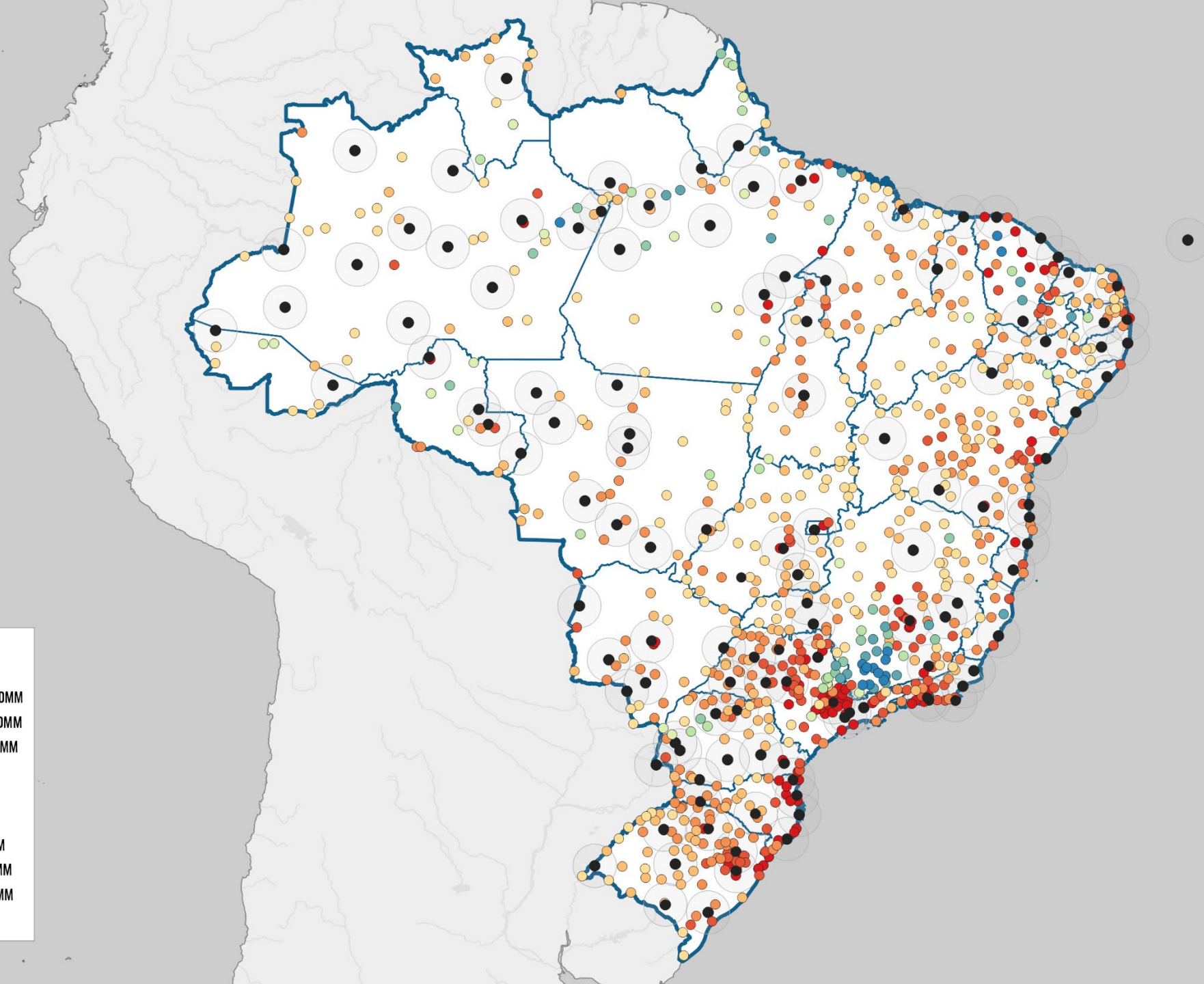
NPSV Base

NPSV Scen. 1

NPSV Scen. 2

NPSV Scen. n

 Δ NPSV Scen. 1 Δ NPSV Scen. 2 Δ NPSV Scen. nSensitivity
analysis





PLANEJAMENTO DE TRANSPORTES

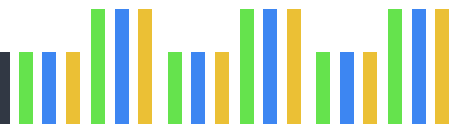
COST-BENEFIT ANALYSIS SIMULATOR

DEVELOPMENT SCENARIO

Best Network of airports

Best Δ NPSV

DEVELOPMENT SCENARIO 1
PAN 2022



DEVELOPEMENT SCENARIO



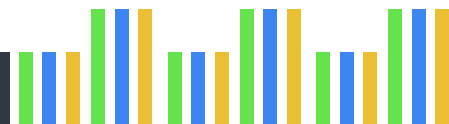


DEVELOPMENT SCENARIO 2

Negative Δ NPSV

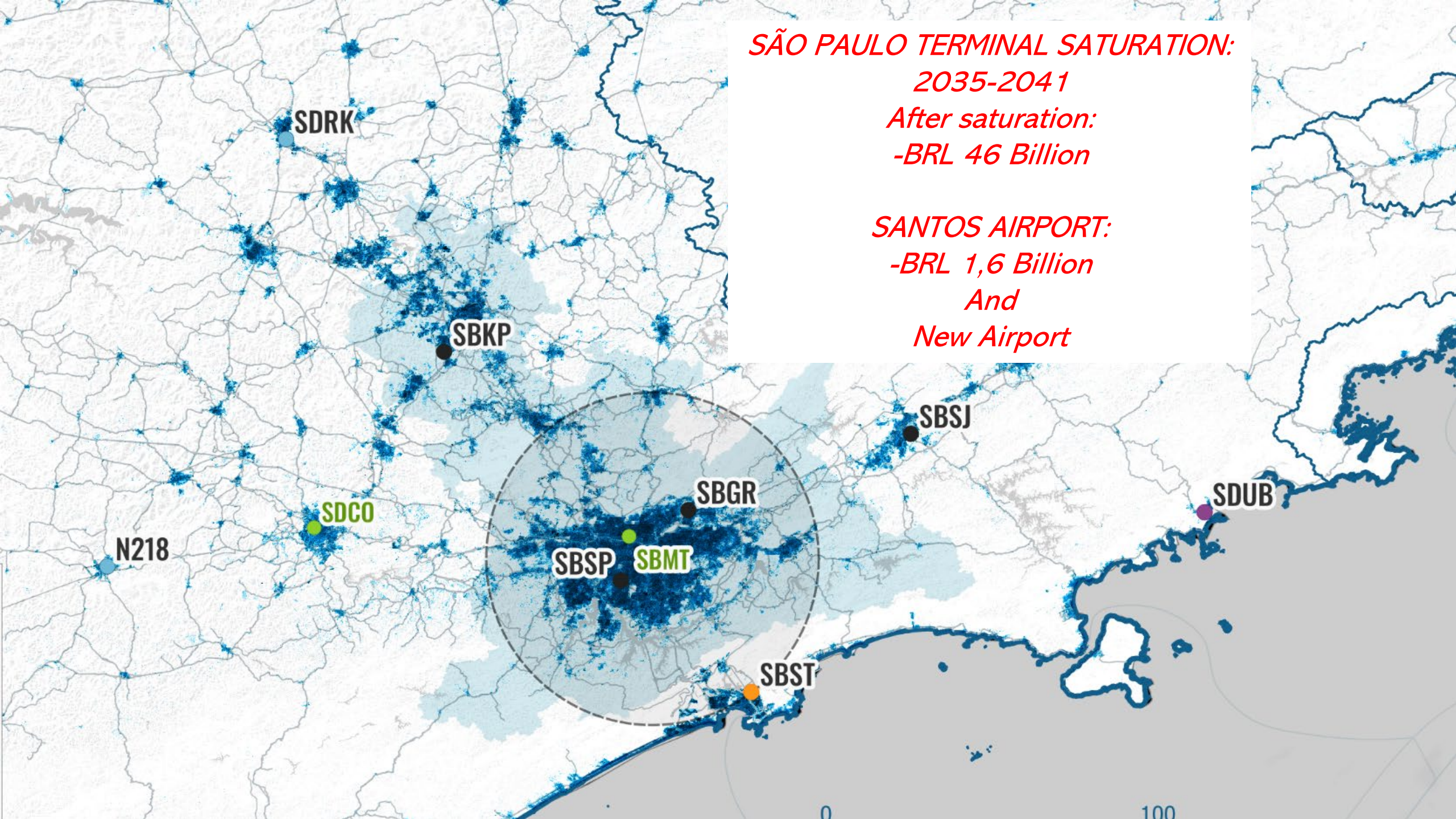
Plenty saturated airports

*Cost of moving passengers to the nearest
airports by ground*



*SÃO PAULO TERMINAL SATURATION:
2035-2041
After saturation:
-BRL 46 Billion*

*SANTOS AIRPORT:
-BRL 1,6 Billion
And
New Airport*



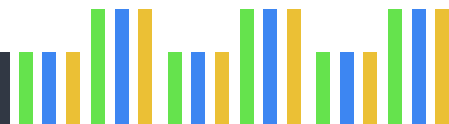


DEVELOPMENT SCENARIO 3

Positive $\Delta NPSV$

By artificial saturation of demand

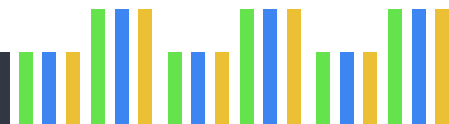
*Increase demand until the inflection of $\Delta NPSV$
Compare this demand with potential touristic
demand of region*





PLANEJAMENTO DE

COST-BENEFIT A





NATIONAL AIRWAY PLAN

GENERAL AVIATION POLICY

STRATEGIC SCENARIO

Airports not included in Base or Development Scenario

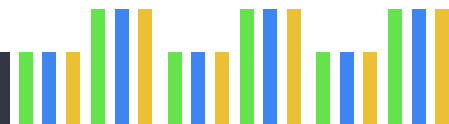
Airports in metropolitan areas (over 2 million passengers processed) serving mostly General Aviation

Airports which train more pilots (80% pilots)

Airports with more aircraft maintenance (70% of establishments)

Airports serving isolated locations (over 5 hours ground travel time)

Aeroportos with scheduled flights above 2,000 passengers/year



STRATEGIC SCENARIO



Thank You!

Antônio Marcos Oliveira
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