SMART BUOY SYSTEM

WP 4.0 e-NAV Services

WP 4.5 Smart Buoy Service

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1. Short reminder of SMB idea & functionality
2. What has been done
   - Disscussions and stake holder interviews
   - Questionnaire
   - Questions
3. Analysis and results
4. Summary of results
5. Technical project

SMB buoy provides near-real time information in support of vessel navigation and local operations within approach to the port.

SMB knows which ships will for sure enter the port and based on this information completely automatically improves navigational data availability

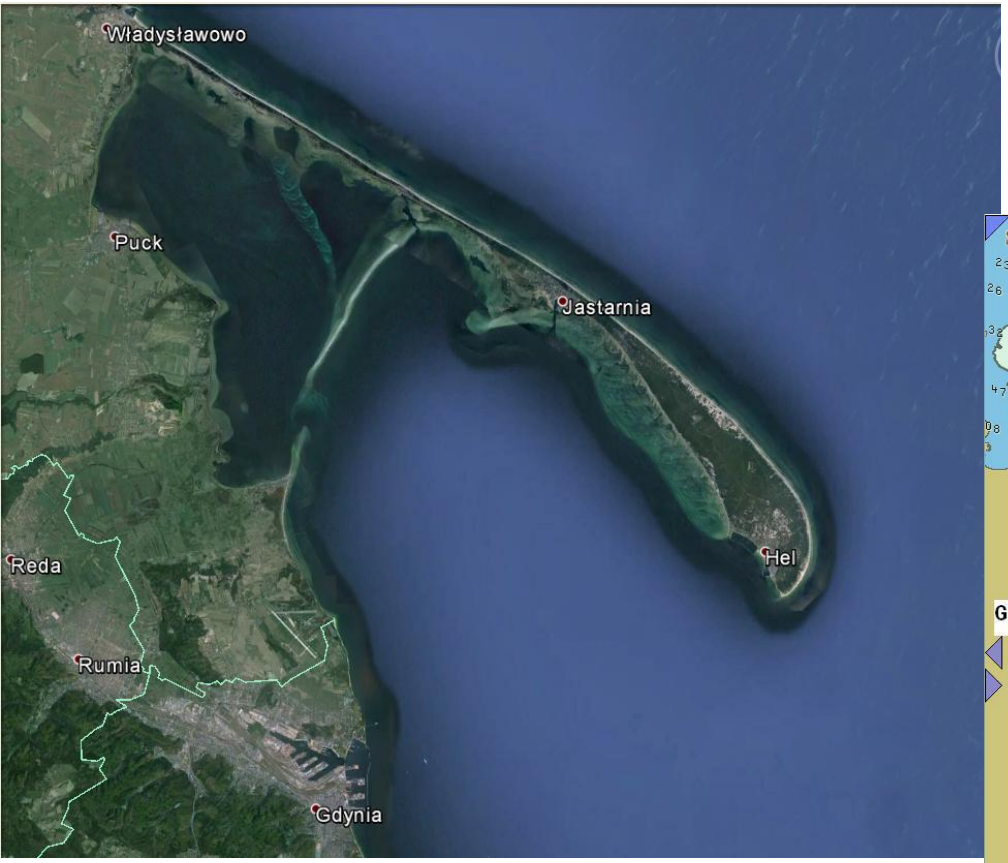
The task is to improve marine awareness and/or

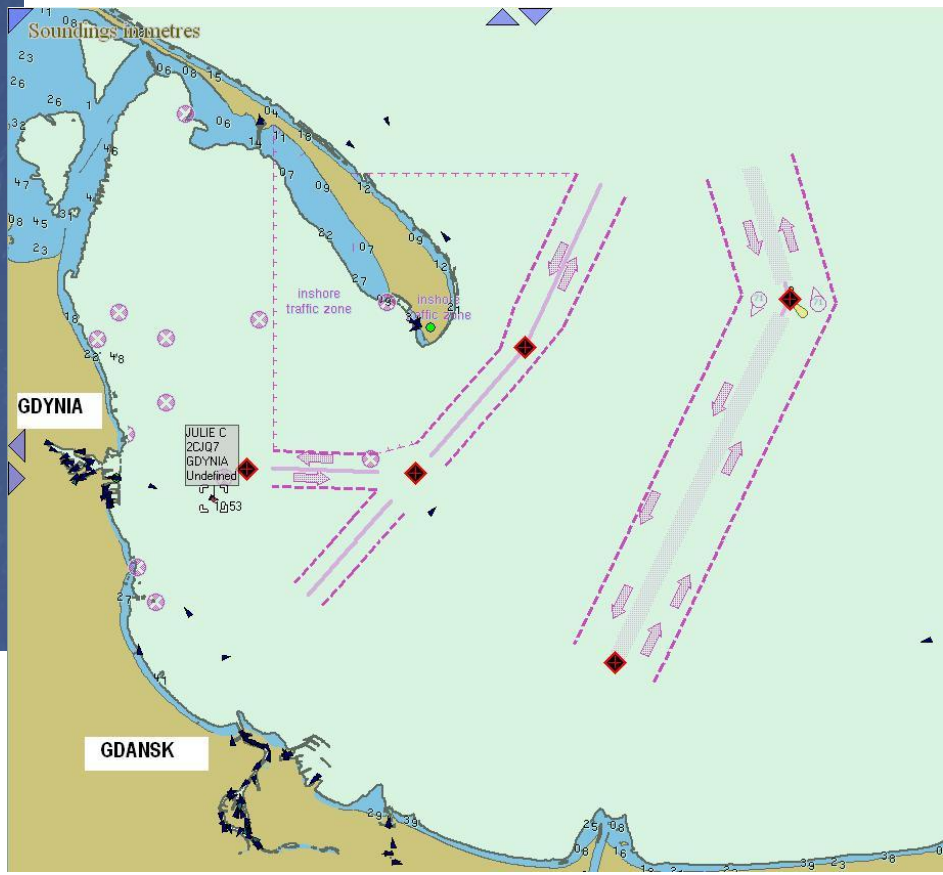
optimize own functionality.

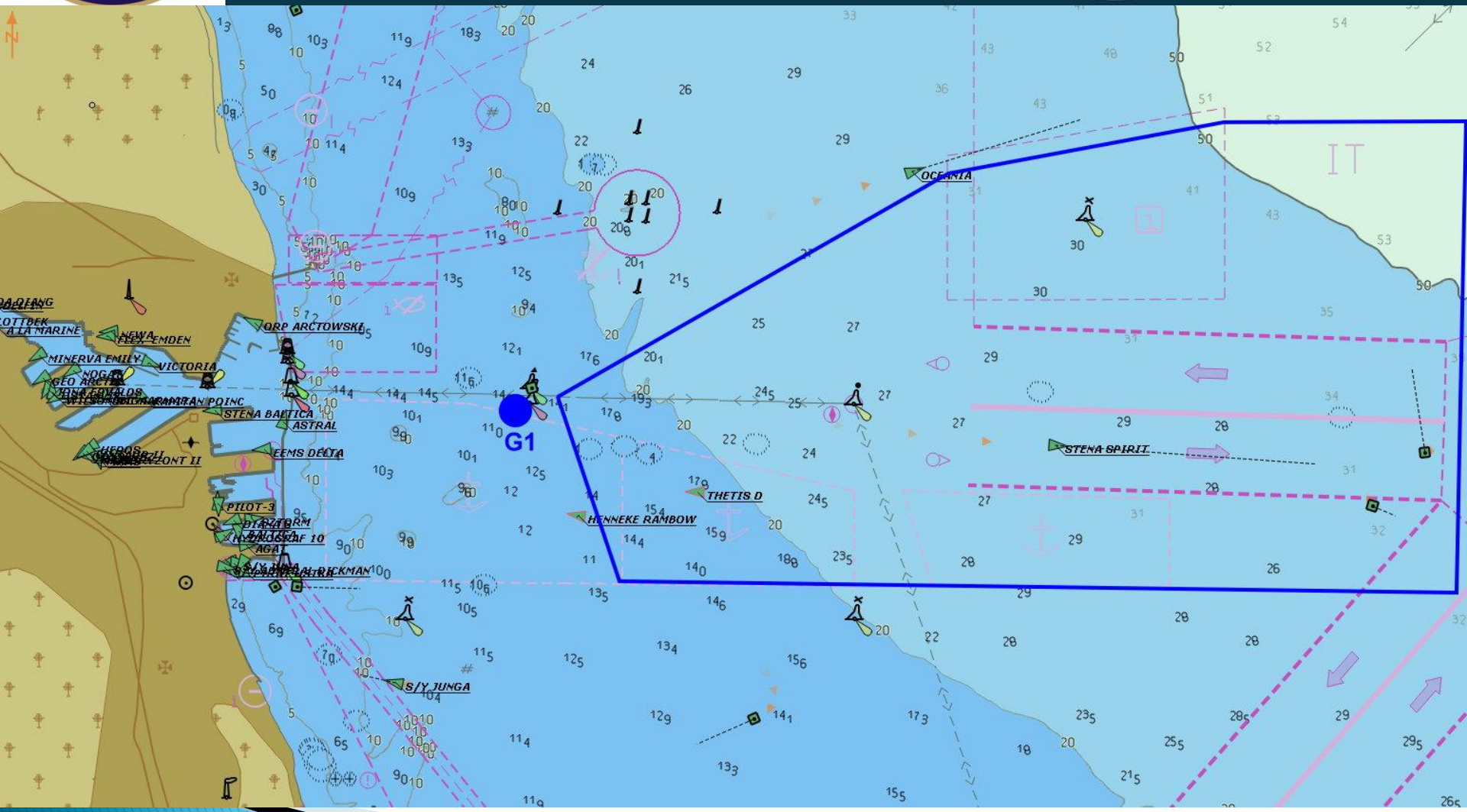
Can interact with local VTS and/or Port Authority

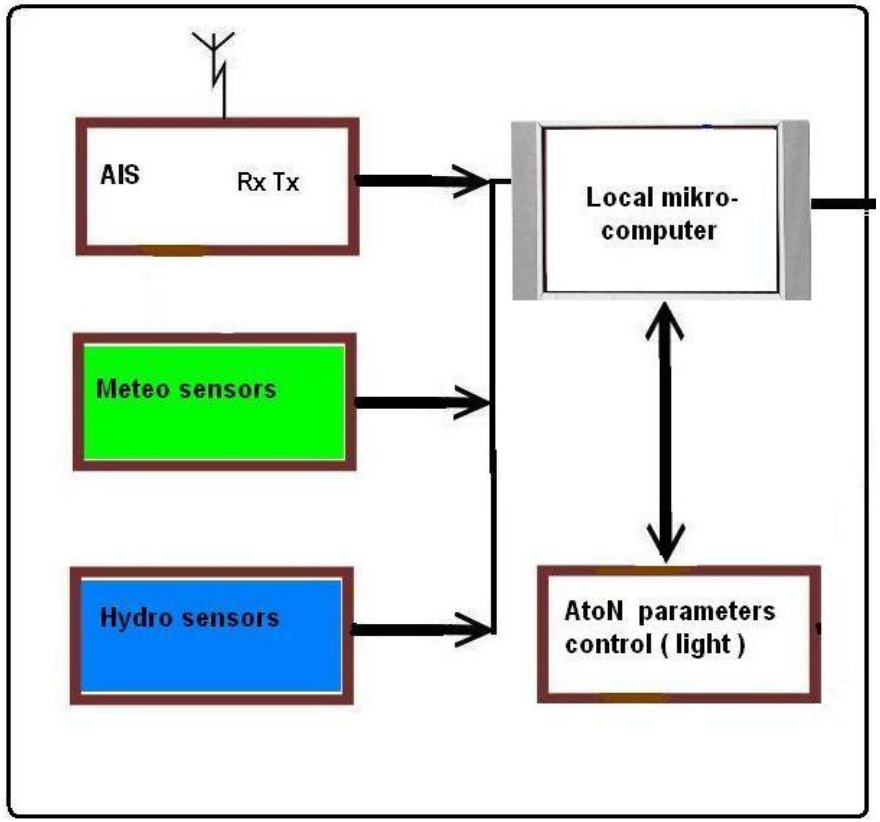
SMB benefits:

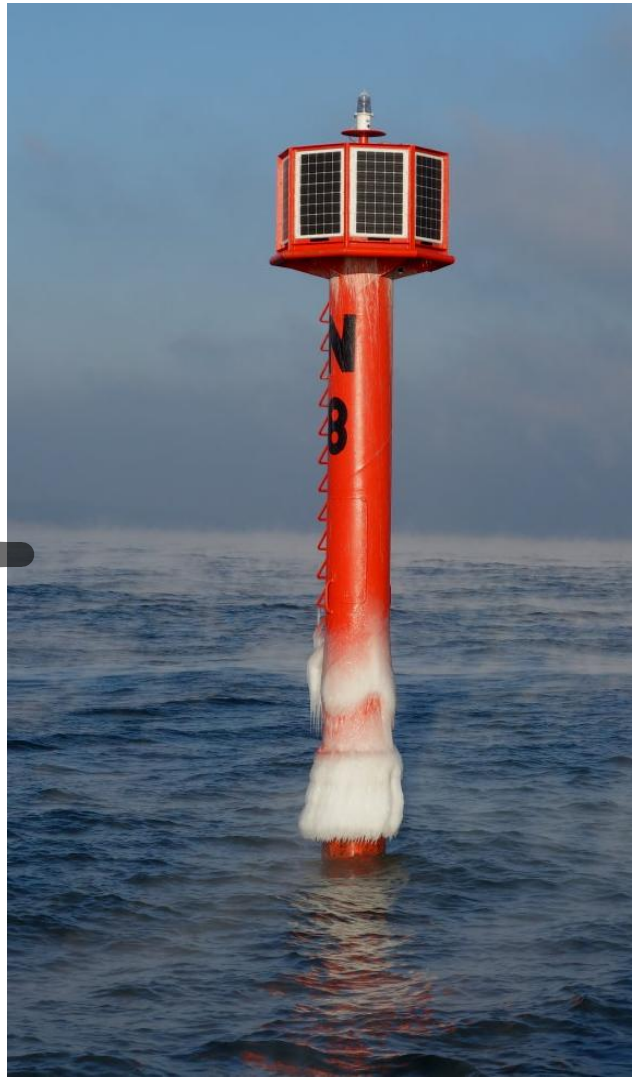
- navigational awareness
- traffic logistic
- AtoN parameter optimization
- environmental surveillance
- nautical information dissemination


Władysławowo
Puck
Jastarnia
Hel
Reda
Rumia
Gdynia


Soundings in metres
inshore
traffic zone
GDYNIA
JULIE C
2CJQ7
GDYNIA
Undefined
GDANSK


G1
ORP ARCTOWSKI
NEWA
FLEX EMDEN
MINERVA EMILY
VICTORIA
STENA BALTICA
ASTRAL
EEMS DELTA
PILOT-3
S/Y JUNGA
OCEANIA
STENA SPIRIT
THETIS D
HENNEKE RAMBOW
IT


AIS
Rx Tx
Local mikro-computer
Meteo sensors
Hydro sensors
AtoN parameters control (light)



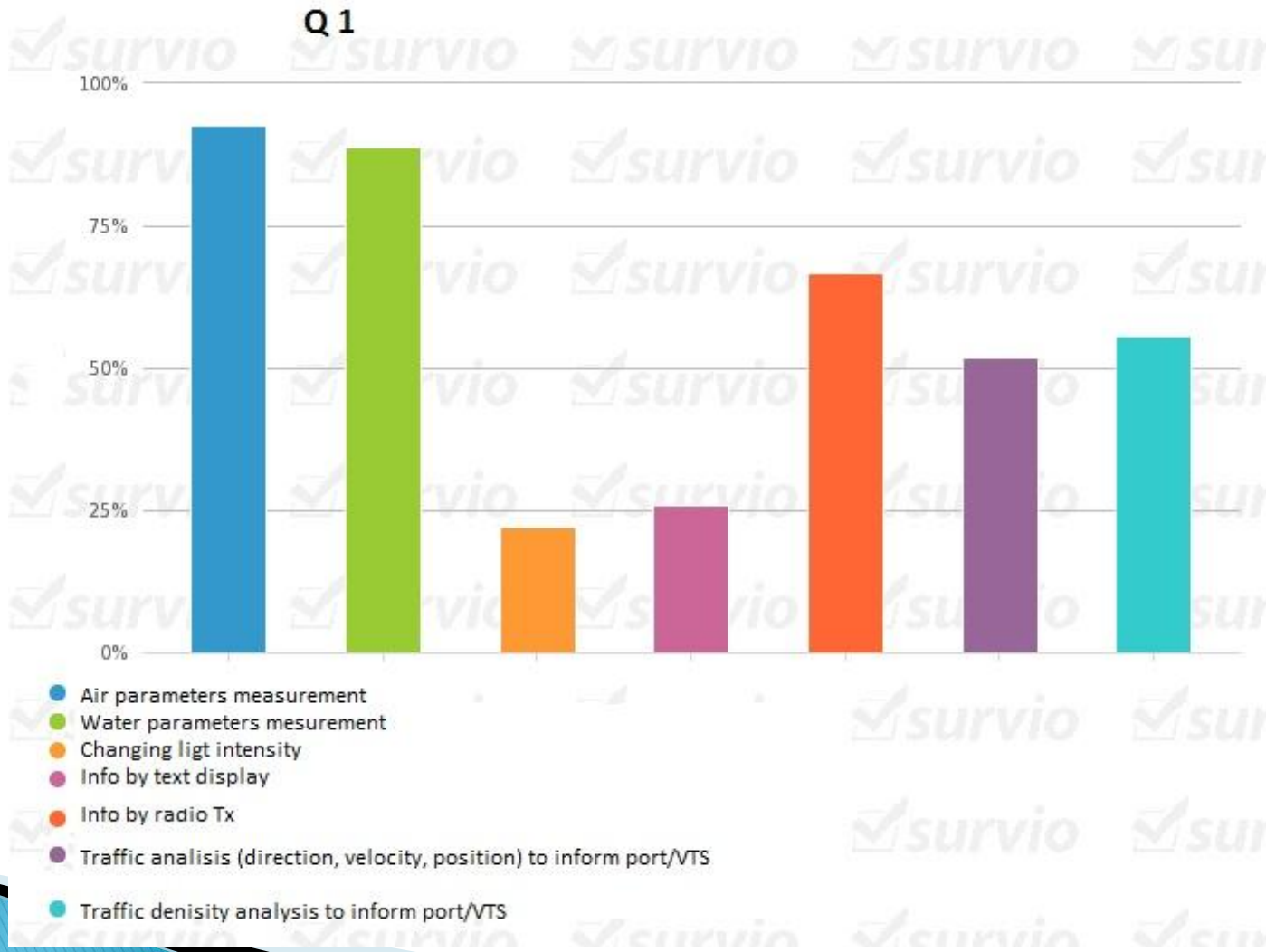
Purpose of questionnaire:

- **to investigate all grups of maritime stakeholders**
- **to ask for a need of real-time situational data**
- **to check the request of functionality**
- **to establish priority of suggested parameters**
- **to ask for reccomended locations**

Q1: **What kind of functionality (if any) should the SMB have ?**

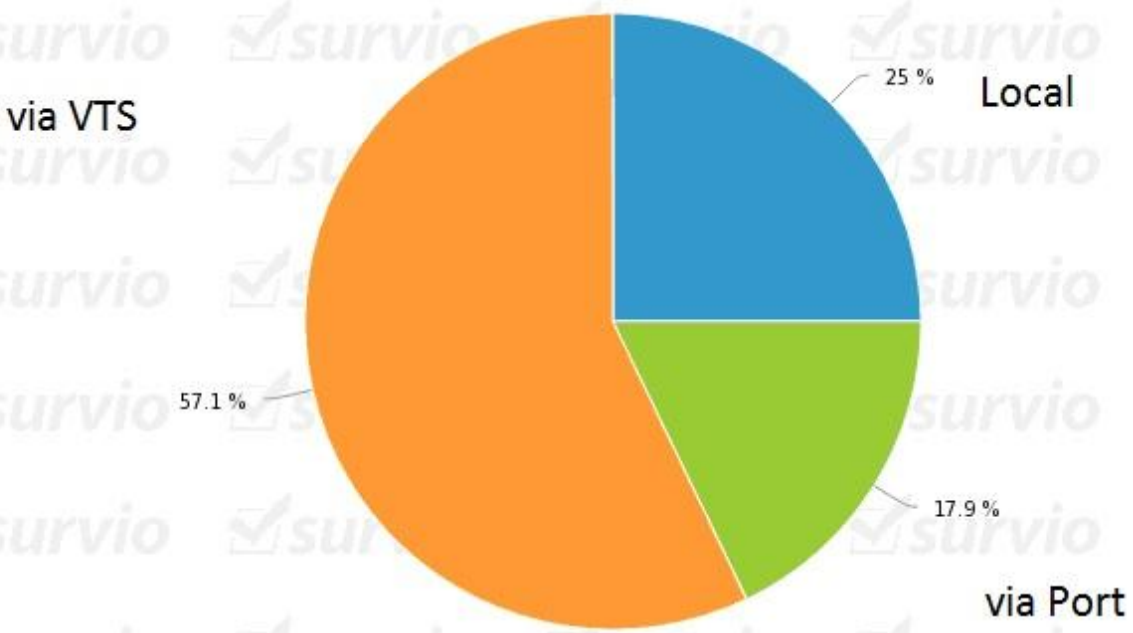
<u>You can choose:</u>

- air parameters measurement, water parameters measurement, changing the light intensity, presenting data on display, radio-broadcasting of messages, , performing short range ship tracking, performing short range traffic intensity analysis, keep the VTS & port informed.
- own position and light system checking, off position warning, navigational warnings re-transmission, changing own light characteristic.


Q 1
100%
75%
50%
25%
0%
Air parameters measurement
Water parameters mesurement
Changing ligt intensity
Info by text display
Info by radio Tx
Traffic analisis (direction, velocity, position) to inform port/VTS
Traffic denisity analysis to inform port/VTS

Q2: **Should the SMB be a local autonomous system or should rather share data and information via VTS or port authorities ?**

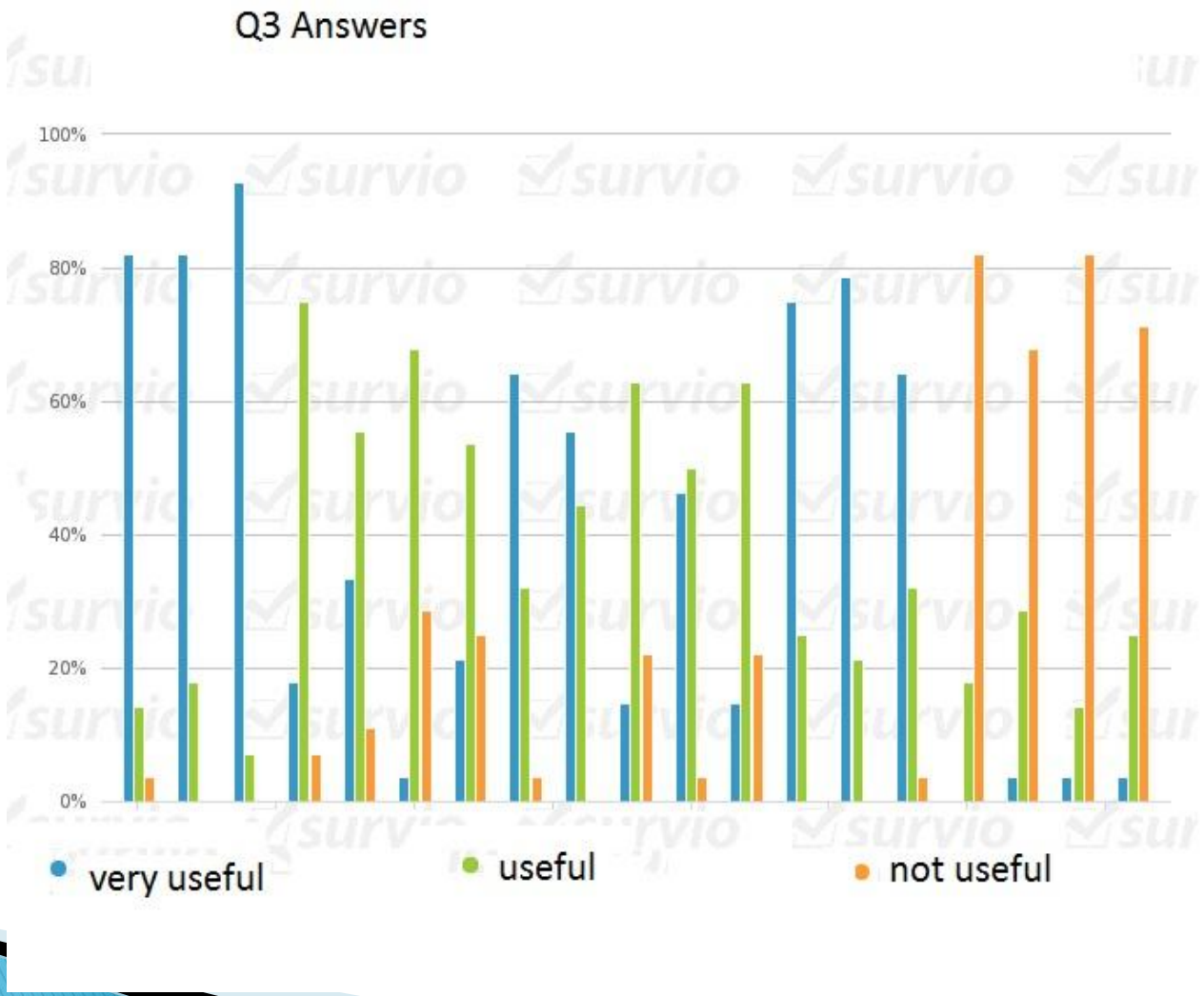
Q2 Answers



Q3: **What are the most important hydro-meteo information you need for the coastal navigation ?**

Pls make a “notch” by stating in every line: very needed, useful, not needed

- mean wind speed,
- max wind speed,
- wind direction,
- air temperature,
- air pressure,
- air moisture,
- surface water temp.
- max. Wave height,
- representative Wave height,
- max. Wave period,
- mean wave direction,
- wave height range,
- water current direction,
- water current speed,
- visibility,
- chemical parameters of the water,
- salinity,
- oxygen in the water,
- turbidity.


Q3 Answers
100%
80%
60%
40%
20%
0%
very useful
useful
not useful

Q4: **Hydro-meteo information you need for navigation – take a set of above column, arrange them in the right order: from the most required to not required.**

You can add some more if you need them…

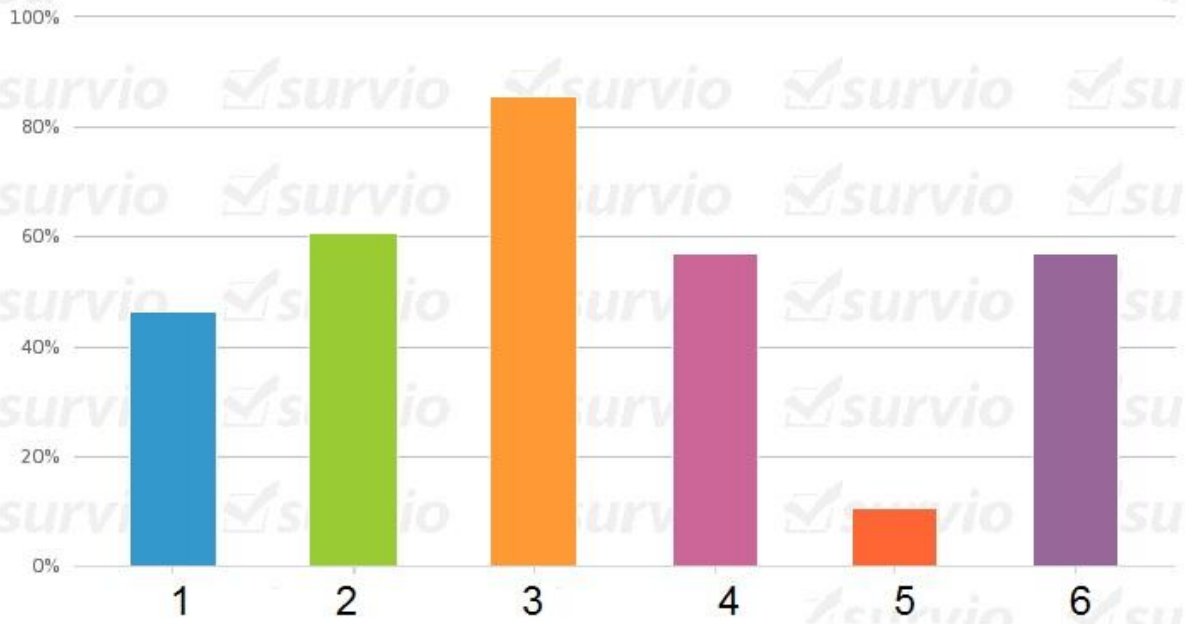
Q4 Answers

1 mean wind speed,
2 max wind speed,
3 wind direction,
4 air temperature,
5 air pressure,
6 air moisture,
7 surface water temp.
8 max. wave height,
9 representative Wave height,
10 max. wave period,
11 mean wave direction,
12 wave height range,
13 water current direction,
14 water current speed,
15 visibility
16 chemical parameters of the water,
17 salinity,
18 oxygen in the water,
19 turbidity.

Q5: **What are your current or future preferable methods to receive information from SMB :**

- mobile phone or sms,
- smart-phone , tablet, using mobile application,
- AIS system,
- via dedicated VHF radio, radiomodem,
- programmable text display mounted on an object / buoy,
- via internet,
- any other ?

Q5 Answers

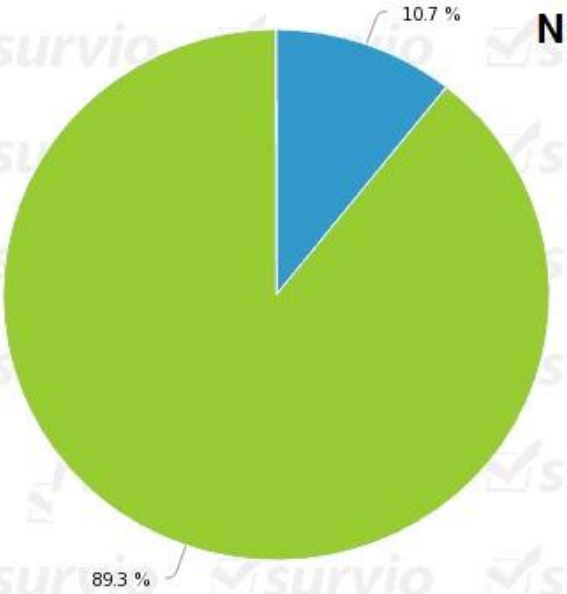


1 via mobile phone or sms,
2 smart-phone, tablet, using mobile application,
3 AIS system,
4 via dedicated VHF radio, radiomodem,
5 programmable text display mounted on an object / buoy,
6 via internet,
- any other ? voice < 3%

Q6: **Do you see a need to install floating SMB system in the vicinity of any of Polish ports, or in any of coastal waters?**

If yes, please state where ?

Q6 Answers



No need 10,7%

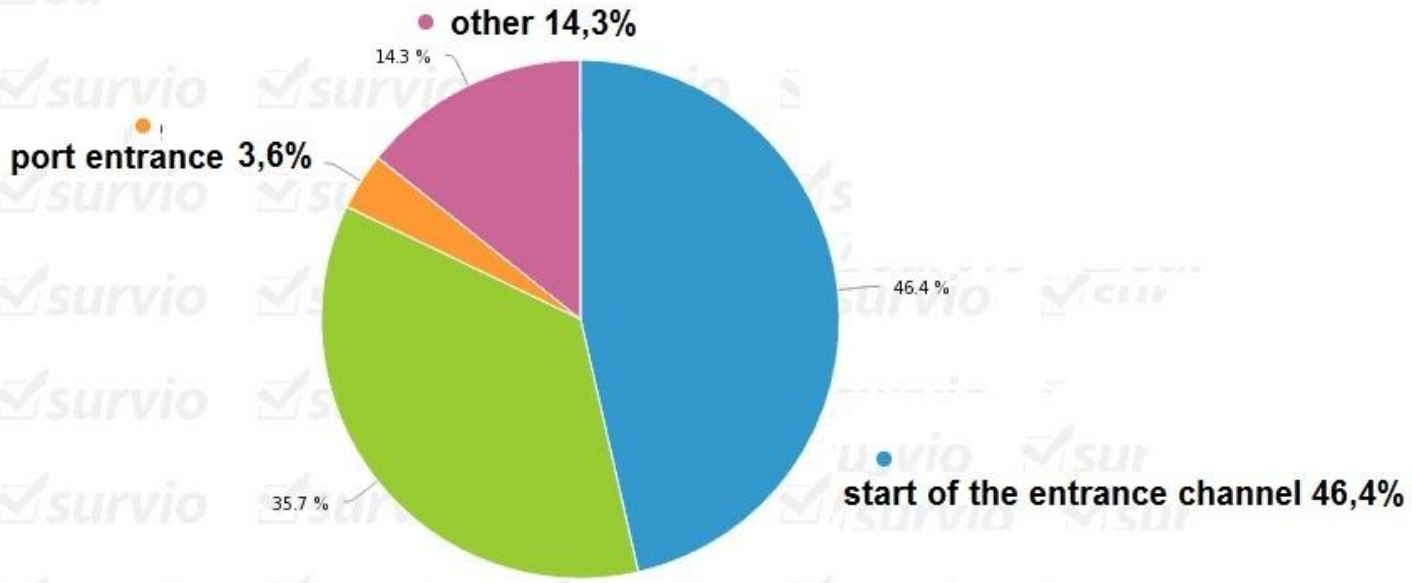
YES 89,3%

+ a number of suggested locations, more then 20

Q7: **Could you point out a position to install SMB within Bay of Gdansk basin?**

- at the beginning of the entrance fairway,
- at the middle of the entrance channel,
- in the port entrance,
- any other, where **?**

Q7 Answers


other 14,3%
14.3 %
port entrance 3,6%
46.4 %
start of the entrance channel 46,4%
35.7 %
middle of the entrance channel 35,7%
other: at ETC crossing, on TSS start, on existing buoys...

SURVEY RESULTS:

Stake holder analysis shows interest in:

- having current information of air and water parameters (mainly wind and current)
- transfering this data via different means of communcations
- VTS involvement in data information
- AIS use for data transmission but mobile devices are also important
- puting such devices/solutions in the begining or in the half of approaching channel

TECHNICAL PROJECT INCLUDED:

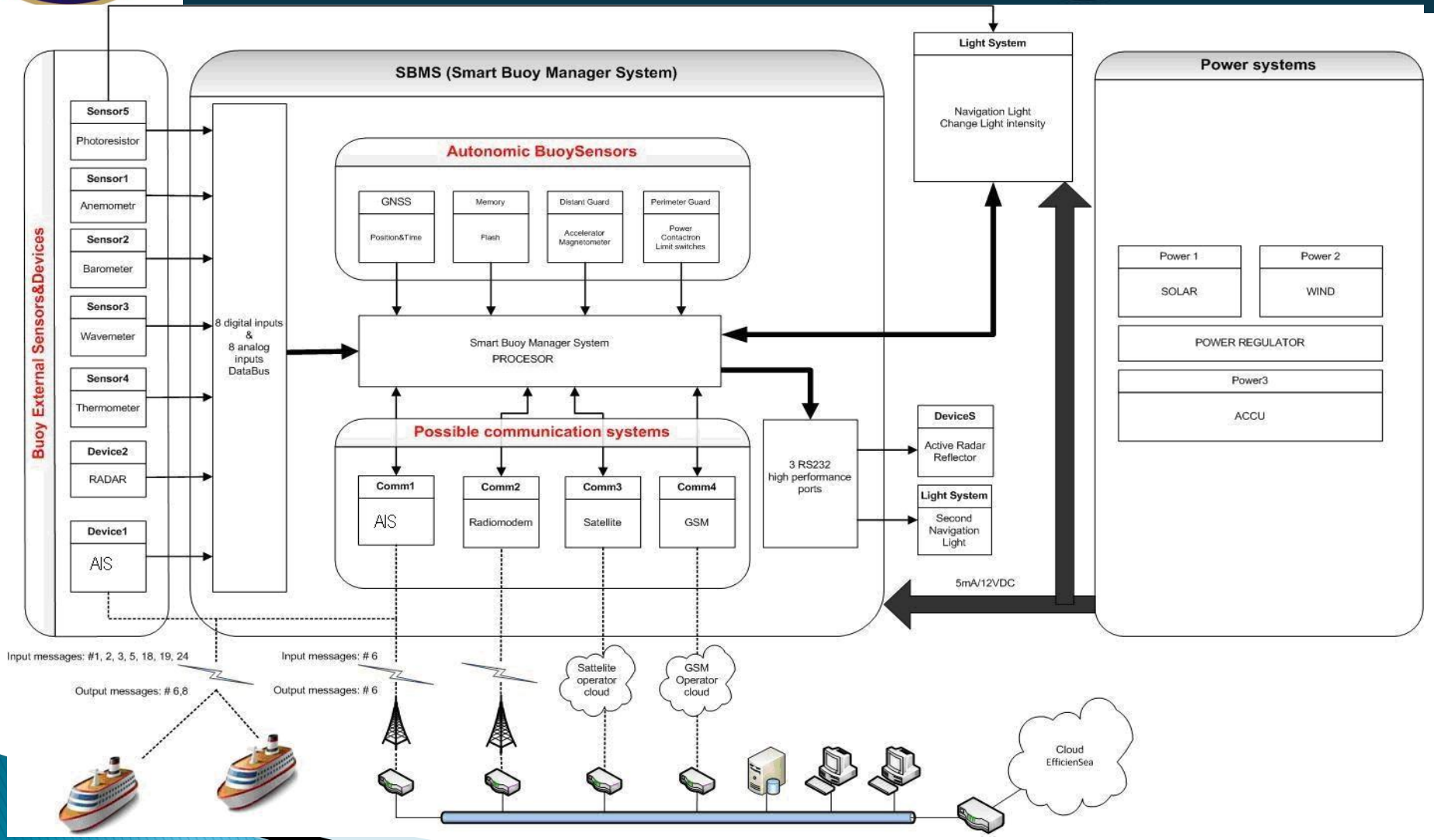
1. Definition of external and internal functionalities:

- communication with ships AIS
- land authorities, GSM,UHF radio, (AtoN admin, VTS service, via Maritime Cloud)
- Internal logistics, data conversion & management (conversion from external and autonomous sensors, AIS data, traffic analysis, hydro-meteo and text messages,
- driving of required external equipment (light on off, light itensity, radar enhancer,)

TECHNICAL PROJECT INCLUDED:

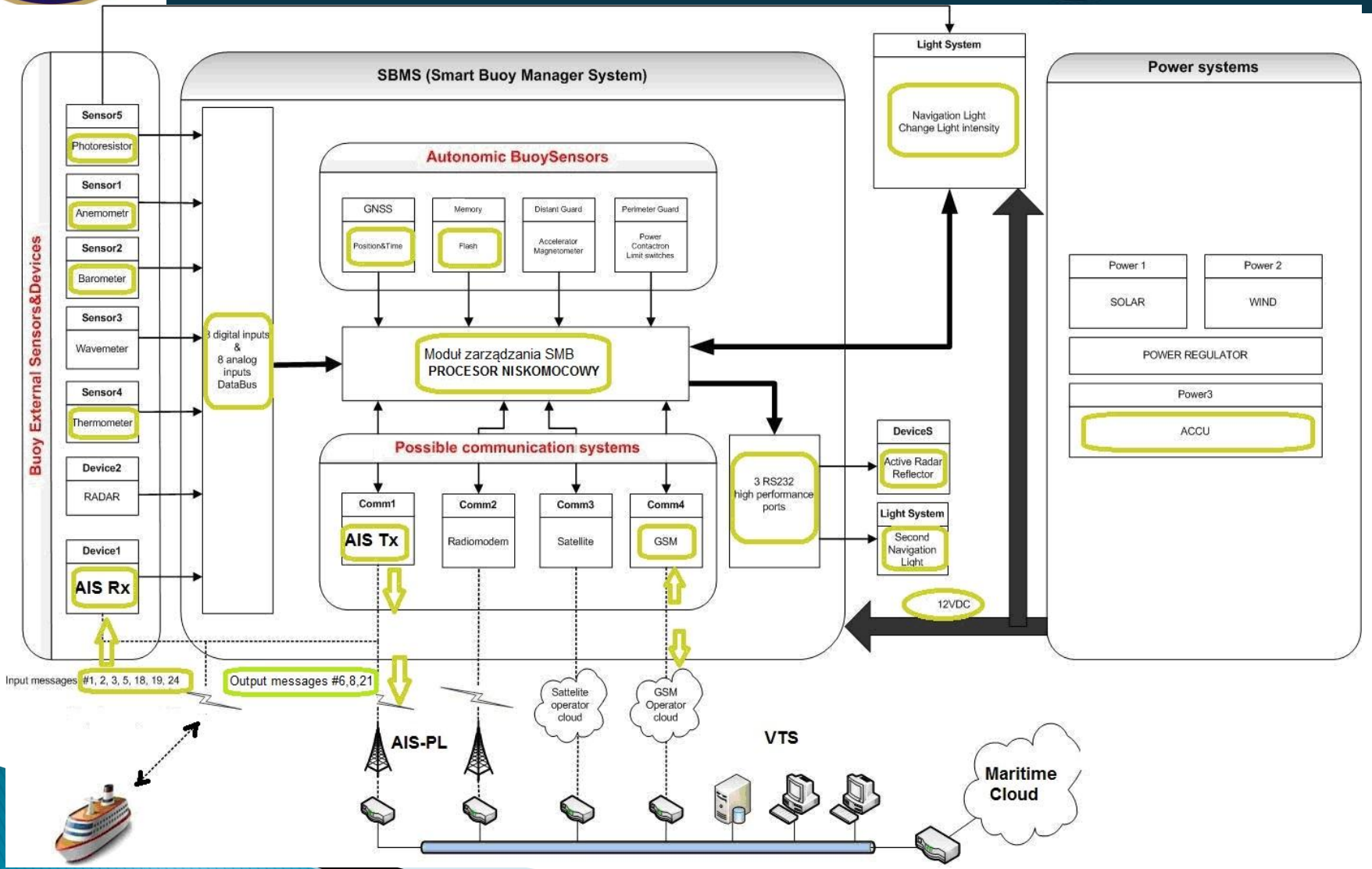
2. Basic general SMB block diagram incl. modules:

- **SMB Manager** based on low power microprocessor with GNSS receiver, RAM and accelerometer,
- **Autonomic and External** buoy Sensors and Devices
- **Possible communication** (AIS, GSM, Sat Comm, Radiomodem)
- **Interfaces**: Coms for External and internal Sensors & Devices logistics
- **Supply** and data bus


Light System
Navigation Light
Change Light intensity
Power systems
SBMS (Smart Buoy Manager System)
Autonomic BuoySensors
GNSS
Position&Time
Memory
Flash
Distant Guard
Accelerator
Magnetometer
Perimeter Guard
Power
Contactron
Limit switches
Buoy External Sensors&Devices
Sensor5
Photoresistor
Sensor1
Anemometr
Sensor2
Barometer
Sensor3
Wavemeter
Sensor4
Thermometer
Device2
RADAR
Device1
AIS
8 digital inputs
&
8 analog
inputs
DataBus
Smart Buoy Manager System
PROCESOR
Possible communication systems
Comm1
AIS
Comm2
Radiomodem
Comm3
Satellite
Comm4
GSM
3 RS232
high performance
ports
DeviceS
Active Radar
Reflector
Light System
Second
Navigation
Light
5mA/12VDC
Power 1
SOLAR
Power 2
WIND
POWER REGULATOR
Power3
ACCU
Input messages: #1, 2, 3, 5, 18, 19, 24
Output messages: # 6,8
Input messages: # 6
Output messages: # 6
Sattelite
operator
cloud
GSM
Operator
cloud
Cloud
EfficienSea

SELECTED SMB MODULES for PROTOTYPE TESTS

- - laboratory tests for individual modules' parameters
- - functional tests of local and external communication
- - aspects of minimum power consumpition in view of green energy
- - test bed at Gdynia Port approaching channel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Limit switches
Buoy External Sensors&Devices
Sensor5
Photoresistor
Sensor1
Anemometr
Sensor2
Barometer
Sensor3
Wavemeter
Sensor4
Thermometer
Device2
RADAR
Device1
AIS Rx
8 digital inputs
&
8 analog
inputs
DataBus
Moduł zarządzania SMB
PROCESOR NISKOMOCOWY
Possible communication systems
Comm1
AIS Tx
Comm2
Radiomodem
Comm3
Satellite
Comm4
GSM
3 RS232
high performance
ports
DeviceS
Active Radar
Reflector
Light System
Second
Navigation
Light
12VDC
Power 1
SOLAR
Power 2
WIND
POWER REGULATOR
Power3
ACCU
Input messages #1, 2, 3, 5, 18, 19, 24
Output messages #6,8,21
AIS-PL
Sattelite
operator
cloud
GSM
Operator
cloud
VTS
Maritime
Cloud

PROGRESS

1. System was described in view of user requirements.
2. Technical project was designed to cover all aspects that can influence final prototype of smart buoy system.
3. Additional assumption has been done
4. Prototype of the system expected to be ready this year.
5. Important data will be simultaneously sent to VTS Centre and Maritime Cloud as part of e-Navigation data.

WHAT ADDED VALUE FOR IALA-IF ANY???

YOURS FAITHFULLY-
MAREK