SYSTEM ANALYSIS FRAMEWORK FOR MUNICIPAL COASTAL GOVERNANCE PROCESS DEVELOPMENT: SALACGRIVA RURAL TERRITORY

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2. Introduction. **Rationale for the case study**

3. Materials and Methods:
   - key elements characterising the case study site
   - current practice of coastal governance: establishing coastal governance scenarios
   - application of SAF methodology
   - fact finding mission: establishing of nature science data charactering long-term changes on the coast

4. Results
   - Clarification of policy issues and cause effect relations
   - Stakeholders and institutional mapping
   - Stakeholders engagement
   - Use of the Indicator system as the ESE model
   - Set of Coastal Governance Tools
   - Recommendations for coastal area multi-use (coastal thematic plan) and coastal spatial planning
SAF general framework was applied to create, based on active public involvement, better coastal development planning and coastal governance processes at the local level

SAF methodology was applied to create coastal municipality owned COASTAL INFORMATION MANAGEMENT SYSTEM – based on SAF, ESE (incl. Governance system/resources) modelling and later adaptation to national/local information possibilities/needs

Innovative coastal governance interface (module) with particular ICZM INSTRUMENTS were developed, for WP5 case territory (to be transferable to all coastal municipalities in Latvia) – all products as national innovations in Latvia:

1- Coastal Outlook
Municipal level Coastal Status and Governance (Thematic) Report’s Content/Process Guidelines – to be basic Source Book/Report/data for any ICZM and OTHER sectors decision making/planning

2- Coastal Municipal Monitoring System
Municipal Coastal Sustainable Development Monitoring Programme:
- for regular/actual info provision and also 2-4 years Coastal Outlook update, incl. and to be used separately also, the following:
  - Coastal Indicators System (incl. detailed list of necessary indicators within ESE frame)
  - Public Coastal Monitoring Programme Outline

3- Integration Guidelines
Blueprint for data/monitoring/procedures integration into mandatory municipal planning PROCESS AND DOCUMENTS – Municipal Development Program (for 7 years period with annual upgrade) and also Spacial Planning/spatial plan
INTRODUCTION:
RATIONALE FOR THE CASE STUDY
Case study is orientated to coastal development and governance - improvement of coastal governance system based on collaboration of the stakeholders as the key driving force for integrated and sustainable coastal zone management (protection, use and development of coastal socio-economic, natural and cultural resources).

Thus, overall objective within Salacgriva case is to adapt and test the general SAF methodology for application in municipal governance sector, understanding coastal areas as both the national (state), municipality and local communities’ interest territories.

We shall find such coastal area and coastal resources governance models, which are adequate and well working in case of long coast rural local municipalities with limited human, administrative and financial etc. capacities and instruments, in order to govern and develop sustainably such complex socio-ecological systems as the coast is.
Improvement of Coastal Governance is based on:

(1) modifying and better use of existing component, namely, better application of existing municipal institutions capacities,

(2) adding new component, namely, opening space for new bottom-up stakeholders initiatives and organizing them in common package.

(3) Integrating this new component and optimising existing component will lead to establishment of new approach for assessment of coastal area state and new governance decisions based on it.

Principal feature of Salacgriva case is that the coastal governance issues are investigated in a long-term perspective.
in case the coastal state quality will be improved by technical infrastructure implementation («hard solutions») – the classical system modelling tools is well suitable for stakeholders involvement and discussions

in case the coastal state quality will be improved by better coastal governance («soft solutions») – the problem is that the system modelling tools, based on mathematical formulae, is not well suited for the modelling impact of coastal governance instruments. There are no yet evidence-based formulae, allowing to mathematically describe the impact of wide range of different governance instruments, and uncertainty of results will be high, limiting the practical use of such modelling results.

Thus we paid efforts to look for other interface system between research (conceptual system dynamic model) and decision making process
• As underlined by the SAF Handbook, the general objective of the SAF is “to provide multidisciplinary and trans-disciplinary advice to environmental managers and policy-makers concerning environmental problems in the coastal zone, in order to improve the zone’s ecological *sustainability*, economic *efficiency*, and social *equity*”.

• Evidently, it means that the SAF approach shall serve as the tool to translate the science knowledge in the language understandable by stakeholders and decision makers and not to lose the science knowledge during this translation.

• **Important Latvia feature is** lack of reliable and in-time information as the critical obstacle for coastal governance: *no information – no governance*
• to establish interface between SAF methodology and coastal & development planning methodology and plans’ supervision - applying of coastal information systems (coastal indicators systems) developed in accordance with SAF methodology
• to demonstrate the transition process from separate isolated research (devoted to single issue) to unified comprehensive multi-disciplinary coastal research;
• to demonstrate the benefits of application of multi-disciplinary coastal research approach to implementation of full coastal governance cycle (from problem identification/analysis to measures/actions monitoring)
• to create the systematic set of Tools which can be used for understanding coastal state, projecting future state and establishing necessary coastal activities. Tools should be at low cost regarding their use and should be implemented based on efforts of municipal specialists and local stakeholders, as possible (minimising necessity for outside experts and skills). To demonstrate the synergy between academic research and citizens science.
MATERIALS AND METHODS
MATERIALS AND METHODS

1. Identification of key elements characterising the case study site
2. Establishing current practice of coastal governance, definition of coastal governance scenarios
3. Application of SAF methodology
4. Fact finding mission: establishing of nature science data characterising long-term changes on the coast:
   • coastal erosion,
   • number of biologically active days 1951 - 2015,
   • number of strong wind days annually 1971 - 2015,
   • precipitation extreme cases characterised by number of 75\textsuperscript{th} percentile exceedances 1961 – 2015
   • etc.
DESCRIPTION OF THE SITE
Map of Latvia:
Riga and Salacgriva municipality – WP5 CSS
Salacgriva rural municipality: related characteristics

- Located approx. only 50–100 km from capital Riga with 700 000 inhabitants, at north bordering with Estonia;
- Long shore line – 55 km (10% - whole Latvia coastline);
- Placed on 5-15 km broad coastal strip, area – 638 km²;
- Permanent inhabitants – 7574 (01.01.2017) and ~36% in Salacgriva town;
- Population density in rural areas (without towns) – less 7 inhabitants per km², what is almost 3 times lower than average in the Latvia;
- 2009 admin reform – 3 small coastal municipalities united
- Riga – Tallinn highway located along/close the coast and new Baltic Railway line Tallinn – Warsaw in coming years will be built via municipality along coastline too.
SALACGRIVA CASE: DOMINATING ELEMENTS

- **Ecological**
  North Vidzeme Biosphere results, Nature 2000 territories
- **Historical – cultural**
  Strategic place on Tallin-Riga road
  Area in which the Latvian sailing ships history had started – places of building and harbours
- **Economic**
  Long traditions on large scale fish processing industry, small scale fishermen businesses (lamprey fishing), both nationally and internationally recognised coastal tourism, local harbor serving for North Vidzeme as well as South Estonia local products (timber, etc). Transit road Riga-Tallin (transit economics)
- **Social**
  Decrease of human capital/population
- **Governance**
  Range of bottom-up governance elements innovative for Latvia
COASTAL GOVERNANCE SCENARIOS
Based on studies and current research outcomes the following basic/general Municipal Governance Scenarios are:

1. Base (BAU – business as usual) governance scenario
2. Top-down governance scenario
3. Bottom-up governance scenario
4. Collaborative governance scenario
Base (BAU) scenario:
In general corresponds to minimum requirements defined by Latvian development planning/management legislation - the coastal development issues mandatory shall be integrated within all municipal planning documents:

- municipal sustainable development strategy (25 years),
- municipal development programme (7 years),
- municipal spatial plan (7/12 years).

Results:
On the bases of analysis of the planning documents of Latvian coastal municipalities it was concluded that this approach:

- Partially works for development planning/management practice of large coastal agglomerations (cities);
- Very limited works for development planning/management practice of small coastal municipalities.
COASTAL GOVERNANCE SCENARIOS

Base (BAU) scenario:

Reasons for failure, e.g.:

- The municipalities’ administration and planning bodies have low interest for such integration, thus only formal integration is performed, if any.
- The state administration bodies have no capacity to control the fulfilment of this requirement.
- The involvement of stakeholders and the society in general in this process is weak.
- Small coastal municipalities’ specialists have not adequate coastal info and have only very limited knowledge how to perform such integration in real municipal development planning/management practice.
Top-down governance scenario:

• The ICZM is integrated within the general municipal governance environment (content, process and products);
• The municipality takes full responsibility for coastal governance, with at least formal/mandatory involvement of local stakeholders.

Results:
On the bases of analysis it was concluded that municipality is not yet capable nor really interested to fully take such wide responsibility
Top-down governance scenario:

Reasons for failure

- Even having environmental planning initiatives and tools, there are not enough incentives to develop such also for coastal planning/governance.
- Latvian coastal municipalities (if not considering large cities) have limited both financial, human and institutional resources to implement this scenario successfully in practice.
- The financing of coastal investments currently is mainly based on external sources, e.g. EU Funds programmes, being limited by:
  - availability of project funds in both amount and time scale; and
  - thematical (contentual) restrictions regarding use of these projects.
**Bottom-up governance scenario:**

- In a great extent the coastal governance is implemented by local coastal stakeholders in partnership with municipality – ICZM function delegation approach;
- The Salacgriva municipality has untraditional range of important bottom-up governance elements like village elderlies, coastal village based NGOs, consultative councils (youth, business), etc.

**Results:**

On the bases of analysis it was concluded that:

- Bottom-up stakeholders are **very important actor** in maintaining established local coastal infrastructure;
- However implementation of coastal governance in **whole municipal** scale is **not possible by using mainly** bottom-up elements
Bottom-up governance scenario:

Reasons for failure:

- bottom-up practice elements mainly are too local and focused on particular village only;
- and communication along 55 km coast is very limited and collaboration even less;
- contentual analysis of local initiatives (LEADER) projects, clearly indicated that the most interest relates to the activities which promote improvement of very important socio-economic processes benefitting locals in coastal territories but not to coastal issues by themselves.
Conclusion: the scenario, based on collaboration, shall be implemented for better coastal governance.

Collaborative scenario shall implement three principal requirements:

1. shall be based on multidisciplinary research results,
2. shall have wide and strong stakeholders involvement component,
3. useful aspects of previous 1.-3. governance scenarios shall be complementary incorporated as far as possible.
STEP 1.
ISSUE IDENTIFICATION
STEP 1. ISSUE IDENTIFICATION

- **Problems** in coastal area identified and link with **Human Activities** established
- Problems **relationships with ecosystem services** established
- Stakeholders **involvement process provided**
- **Institutional mapping** done, personalized stakeholders established
- **DPSIR analysis** provided
- **CATWOE model** developed
- **Social and Economic components relevant** for the Issue **identified**
- **Priorities of village level stakeholders established** – analysis of implemented local projects (LEADER programme), their relations to the coastal state
Problems and Human Activities identification were done according the following Template

<table>
<thead>
<tr>
<th>Problems</th>
<th>Localization</th>
<th>List of Human Activity</th>
<th>Causing Stakeholders</th>
<th>Interested in solving Stakeholders</th>
</tr>
</thead>
</table>
STEP 1. ISSUE IDENTIFICATION
Framework for DPSIR analysis

Driving
Coastal territory is understood as a territory of interaction on diverse human society needs, mainly represented by:
• needs of local coastal citizens
• needs of visitors for recreation
• needs of wider human society for natural capital, biodiversity, united coastal nature-culture heritage

Pressure
Activities of coastal citizens that are performed to ensure living space and related to it self-sustainability
Visitors activities and impact to coastal environment is directly dependent form efficiency of coastal governanance
Pressures which are created due to lack of Human Activities

State
State of Coast – Natural state, Economic state, Social State

Impact
Loss of quality of unified coastal nature and culture heritage

Responses
• Development of „bottom-up” self- governance for coastal territories management
• Interaction of municipal (top-down) and „bottom-up” processes – development and enhancement of integrated coastal zone management system,
• Implementation of coastal information system
• coastal communication (information, education, stakeholders participation, environmentally sound behaviour/actions) covering both local people and visitors.
STEP 2.
SYSTEM DESIGN
STEP 2. SYSTEM DESIGN

- Relevant coastal area **geographical boundaries for data established**
- **Subsystems described** - elements and material flows as well as external hazards within Nature, Social, Economic and Governance subsystems of the Coast
- **Conceptual model** developed (1\textsuperscript{st} iteration)
- **Translation of conceptual model to STELLA language** (2\textsuperscript{nd} iteration), increased complexity and number of elements in subsystems compared with the 1\textsuperscript{st} iteration provided
STEP 2. SYSTEM DESIGN

Hierarhy of data established, based on relevance for coastal governance and availability

Depending from contentual substance of the data and features of data spatial distribution, each data has defined territory, which in the case of particular data is called as the coastal area.

- monitoring points & measurement spots
- Beach/Bathing places
- Coastal dune protection zone
- Coastal protection zone
- Notional territory (mainly to the West from road A1 Riga – Tallinn)
- Whole municipality,
- In addition, special areas – port, small rivers
### STEP 2. SYSTEM DESIGN

**Elements and material flows within Nature and Governance subsystems established (as the example below)**

<table>
<thead>
<tr>
<th>SES components</th>
<th>Material flows</th>
<th>External Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Ecological components of the SES are:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. shore line</td>
<td>Main Ecological (material) flows are:</td>
<td>Climate risks (storms, extreme weather conditions, floods, rain falls)</td>
</tr>
<tr>
<td>2. beach and coastal dunes</td>
<td>1. marine litter</td>
<td>Ship pollution</td>
</tr>
<tr>
<td>3. valuable biotopes and habitats</td>
<td>2. nutrients flow (by natural systems: rivers etc.)</td>
<td>Algae blooming</td>
</tr>
<tr>
<td>4. coastal forests</td>
<td>3. sediment s (sand)</td>
<td>Coastal fires (forests, reeds)</td>
</tr>
<tr>
<td>5. marine resources (fish, algae)</td>
<td>4. coastal erosion floods</td>
<td></td>
</tr>
<tr>
<td>6. water quality</td>
<td>5. floods</td>
<td></td>
</tr>
<tr>
<td>7. weather conditions</td>
<td>6. wind falls</td>
<td></td>
</tr>
<tr>
<td>8. sand and stones</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>SES components</th>
<th>Material flows</th>
<th>External Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Governance components are:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Local administration capacity</td>
<td></td>
<td>Administrative Territorial reform</td>
</tr>
<tr>
<td>2. Local regulation acts</td>
<td></td>
<td>Conflict between local and national development interests</td>
</tr>
<tr>
<td>3. Specific areas specialists (environmental /nature/culture )</td>
<td></td>
<td>Brains outflow (loss of experienced people)</td>
</tr>
<tr>
<td>4. Coastal Information system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Participation mechanisms (elderly institution; councils etc)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. NGO</td>
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</tbody>
</table>
Conceptual model development: background
The central issue of the overall system **Unsustainable governance of coastal resources**
- What comprises coastal resources?

The approach had been based on environmental governance goals, namely, the coastal resources are characterized through: protection of biological diversity, environmental quality and sustainable use of natural resources

- System components

**Governance subsystem** is added to SES. Governance subsystem had become a central block allowing to address an issue of “unsustainable governance of coastal resources”

- Flows conceptualization
- “pollution flow” impact is negative
- “direct physical impact” might be positive or negative

- Environmental actions models

Certain factors of the system which influence system behaviour is put in the centre (see next slides)

- Impacts of external subsystems (see next slides)
STEP 2. SYSTEM DESIGN

Through “Environmental action models” we create links between:

• Environmental governance and especially instruments what are at disposal or should be developed by municipal administration

• stakeholder groups that are representing local social, economic systems as well as economic transit system

• application of specific governance models and instruments act on stakeholders and try push them towards desired coastal friendly activities/behaviours

• it has positive direct impact on reducing pollution of coastal area/resources depletion
Impacts of external subsystems manifests:

- On local economical activities
- On Social system, the central element of that in this model is households and their practices or environmental activities
- Marine litter as emerging globally and also specifically to the coast in Salacgriva municipality
- External natural system - impacts show as coastal erosion
- Algae blooming causing direct social and economic impacts (loss of property value, impacts on visitors in season etc)
- Appearance of invasive species (climate change) causing the similar impact through restricting open coastal space for visitors placement
The SDM has allowed to establish the optimum number parameters set (necessary and sufficient) to characterize the state of the coast in rural coastal municipalities.

Continuing, the analysis of the SDM have allowed

(i) to understand in details the on-going natural (ecological) and socio-economic processes in the typical Latvia coastal areas and their interaction,

(ii) to understand the necessary framework for the interface to link science - governance decision making.

Thus, the main objective for the next step was to perform the transfer from mostly research (as the development, modelling and analysis of SDM) to practical improvement of the coastal governance.
STEP 3&4
SYSTEM FORMULATION AND APPRAISAL
COASTAL INDICATOR SYSTEM AS THE SAF TOOL
Based on system dynamic model
Algorithm developed how to transfer model’s parameters to Indicators of the indicator system

We have elaborated the approach how the system dynamics model can be translated to coastal indicators system.

Important, that indicators system is both information flows system and modelling tool, well understandable by stakeholders, as the tendencies in indicators values allows to project future state.

Indicators come from values and create values (indicators measure the parameters which are important for local society and consensus about new indicators means recognition by stakeholders new values)

Cost of indicators system can be lowered by involving in their measurement both local municipal specialists and stakeholders groups (public monitoring, citizens science).
Coastal Indicators System

CIS is designed for coastal long-term planning and planning documents (coastal governance strategy, thematic plan etc.) due to observe sustainability and sustainable development. With minimal transformations the developed for Salacgriva municipality system can be adapted for other coastal municipalities of Latvia.

The transforming of the SDM to CIS was done based on the following principles:

• evaluating the dynamism of SDM parameters and including in the CIS those parameters with sufficient dynamics;

• evaluating regular, reliable and on coastal area applicable data obtaining opportunities from publicly available data sources or by applying other direct methods for data obtaining, incl. citizen science;

• including indicators which provide a link with the Salacgriva municipality long-term sustainable development strategy till 2030 and mid-term municipal development programme;

• evaluating necessity of additional indicators to characterize the coastal natural- socio economical system in the more detailed manner based on the capitals of sustainable development.
RESULTS
RESULTS

• Clarification of policy issues and cause effect relations
• Stakeholders and institutional mapping
• Stakeholders engagement
• Use of the Indicator system as the ESE model
• Set of Coastal Governance Tools
• Recomendations for coastal area multi-use (coastal thematic plan) and coastal spatial planning
CLARIFICATION OF POLICY ISSUES AND CAUSE EFFECT RELATIONS
• 16 sectorial problems had been identified in given coastal territory
• Matrix of relationships among identified problems established (direct, indirect and explicit, less explicit links)

• Analysis of their structure had allowed to conclude on 3 generic type problems:
  Insufficiently managed low density territories,
  Low environmental management/ governance capacity
  Limited coastal communication
### PROBLEMS: MATRIX OF RELATIONSHIPS

3 – direct, explicit link; 2 – direct, less explicit link; 1 – indirect link; 0 – unclear link

| Nr. | Problema | Respective Nr. of related problem | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | Σ  |
|-----|----------|----------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1.  | Restricted access to sea         |                                  | 3  | 3  | 0  | 0  | 2  | 0  | 1  | 0  | 0  | 0  | 1  | 2  | 1  | 3  | 3  | 2  | 0  | 3  | 24 |
| 2.  | Coastal erosion                  |                                  | 3  | 0  | 1  | 3  | 2  | 1  | 0  | 0  | 0  | 2  | 0  | 1  | 1  | 3  | 1  | 3  | 3  | 2  | 26 |
| 3.  | Access of coast for people with special needs |                      | 3  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 2  | 3  | 0  | 1  | 12 |
| 4.  | Coast erosion                    |                                  | 0  | 1  | 0  | 3  | 1  | 1  | 1  | 0  | 2  | 1  | 2  | 3  | 0  | 1  | 1  | 1  | 1  | 19 |
| 5.  | Over flooding during storms      |                                  | 0  | 3  | 0  | 3  | 1  | 2  | 1  | 0  | 0  | 3  | 1  | 3  | 0  | 1  | 0  | 1  | 1  | 23 |
| 6.  | Risks to valuable biotopes       |                                  | 2  | 2  | 0  | 1  | 1  | 0  | 0  | 2  | 2  | 0  | 0  | 1  | 1  | 0  | 1  | 2  | 3  | 3  | 21 |
| 7.  | Sea water quality                |                                  | 0  | 1  | 0  | 1  | 2  | 0  | 2  | 2  | 3  | 2  | 0  | 3  | 0  | 2  | 1  | 0  | 1  | 0  | 20 |
| 8.  | Human safety in bathing/swimming places |                   | 1  | 0  | 1  | 1  | 1  | 0  | 2  | 1  | 2  | 1  | 3  | 0  | 3  | 0  | 3  | 0  | 1  | 2  | 21 |
| 9.  | Nutrients pollution from rivers  |                                  | 0  | 0  | 0  | 0  | 0  | 2  | 2  | 1  | 2  | 1  | 2  | 2  | 1  | 0  | 0  | 1  | 2  | 1  | 17 |
| 10. | Indvidual households’ wastwaters |                                  | 0  | 0  | 0  | 0  | 0  | 2  | 3  | 2  | 2  | 0  | 0  | 2  | 0  | 3  | 1  | 3  | 2  | 2  | 22 |
| 11. | Potential pollution form industrial sites |                  | 0  | 2  | 0  | 3  | 3  | 0  | 2  | 1  | 1  | 0  | 0  | 2  | 1  | 0  | 1  | 0  | 1  | 0  | 17 |
| 12. | Forest damage                   |                                  | 1  | 0  | 0  | 1  | 1  | 0  | 0  | 1  | 2  | 0  | 0  | 0  | 2  | 1  | 2  | 1  | 1  | 0  | 17 |
| 13. | Marine litter                    |                                  | 2  | 1  | 1  | 2  | 3  | 1  | 3  | 3  | 2  | 3  | 2  | 0  | 0  | 2  | 0  | 1  | 2  | 1  | 29 |
| 14. | Risks to nature and culture capital |                            | 3  | 2  | 0  | 3  | 3  | 1  | 0  | 0  | 1  | 0  | 1  | 2  | 0  | 0  | 2  | 3  | 2  | 3  | 22 |
| 15. | High local seasonal pressures    |                                  | 3  | 3  | 1  | 0  | 0  | 0  | 3  | 3  | 0  | 3  | 0  | 1  | 2  | 0  | 0  | 1  | 1  | 0  | 21 |
| 16. | Construction of residential buildings on coast |              | 3  | 1  | 2  | 1  | 1  | 1  | 0  | 0  | 1  | 1  | 2  | 0  | 1  | 0  | 2  | 1  | 2  | 2  | 20 |
# PROBLEM RELATIONSHIP WITH ECOSYSTEM SERVICES

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Problem/Services group</th>
<th>Prod</th>
<th>Regul</th>
<th>Val.</th>
<th>Func.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Restricted access to sea</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>Coastal erosion/dune existence</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>3.</td>
<td>Access of coast for people with special needs</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>Coast erosion/shoreline preservation</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>5.</td>
<td>Over flooding during storms/areas with minimized risk of flooding</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>Risks to valuable biotopes/the existence of valuable habitats</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>7.</td>
<td>Sea water quality</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>8.</td>
<td>Human safety in bathing/swimming places</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td>Nutrients pollution from rivers/ensuring the quality of water in rivers and on the coast</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>10.</td>
<td>Individual households’ wastwaters/ensuring the quality of water in rivers and on the coast</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>11.</td>
<td>Potential pollution form industrial sites/industrial territories with (at least) no increase in the amount of pollution</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>12.</td>
<td>Forest damage/the existence of high-quality forest ecosystems</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>13.</td>
<td>Marine litter/unpolluted coastal assurance</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>14.</td>
<td>Risks to nature and culture capital/natural and cultural heritage of the existence of high quality</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>15.</td>
<td>High local seasonal pressures/providing minimally polluted coastal zone in sezonality visiting periods</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>16.</td>
<td>Construction of residential buildings on coast/dune existence</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>17.</td>
<td>Insufficiently managed low density territories</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>18.</td>
<td>Low environmental management/governance capacity</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>19.</td>
<td>Limited coastal communication/the existence of coastal communication</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

Service group involvement  

<table>
<thead>
<tr>
<th>Prod</th>
<th>Regul</th>
<th>Val.</th>
<th>Func.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>34</td>
<td>42</td>
<td>31</td>
<td>136</td>
</tr>
</tbody>
</table>

The share of service group  

<table>
<thead>
<tr>
<th>Prod</th>
<th>Regul</th>
<th>Val.</th>
<th>Func.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>21%</td>
<td>25%</td>
<td>31%</td>
<td>23%</td>
<td>100%</td>
</tr>
</tbody>
</table>
PROBLEMS IDENTIFICATION:
KEY FINDINGS

• **There are few local coastal territories where resources are over exploited or used in interests of limited stakeholder group or even individuals,** this creates additional stress on resources, as well as environmental pollution, as well as discomfort among other stakeholders

• **At the same time, there are local coastal territories where resources are under managed, causing risks for further degradation of coastal resources.** Insufficient management is caused by:

(1) disperse and very low density population on the coast limits basis for sustainable coastal management,

(2) stakeholders (including municipal authorities) insufficiently understand the potential of the coastal resources for local development;

(3) there are still no adequate reliable information to support sustainable use of coastal resource for local development

(4) insufficient municipal efforts in ensuring adequate coastal management (social needs prevail);
STAKEHOLDERS AND INSTITUTIONAL MAPPING
Institutions involved in the coastal management/governance identified and their roles/activities established

It was identified more than 130 institutions currently involved or having potential interest for coastal governance

• **Authorities** – 56 (state level 21, regional 9, municipal 16, villages (parishes administration and elderly) 10)

• **Public service enterprises** – 3

• **Local businesses** - 13

• **Communicators** – 21 (national level 3, regional 2, Local: newspapers 2, Education establishments formal and non-formal – 11, museums 2, tourism centre 1)

• **local NGOs** – 39 (cross horizontal 32, villages based 7)

personalised stakeholders established as well
STAKEHOLDERS ENGAGEMENT
STEP 1. ISSUE IDENTIFICATION

Stakeholders involvement process

- on-site interviewing (August 2015), face-to-face meetings hold
- Stakeholders workshop (October 2015),
- On-site meetings with local authorities as well as other local stakeholders (November 2015), ~30 face-to-face meetings hold
**Stakeholders involvement**

The on-site meetings have been done with the following categories of the stakeholders *(August 2016)*

- deputies of municipal Council
- municipality executive power and institutions,
- representatives of local bottom-up structures of coastal villages
- visitors of the beach (by questioning method, end of August 2016)
- discussion seminar organized as the final event of the campaign “My Sea”
- questioning of selected coastal households in the municipality (in Salacgriva and Ainazi towns and Svētciems and Tūja villages)

**Results:**

More precise information on stakeholders perceptions, needs and priorities as well as collaboration among them
Step 5. System Output

Stakeholders Discussion on implementation of developed Coastal Indicators System

- preliminary meetings with selected youth focused stakeholders (Salacgriva area Youth NGO “Bāka” (Beacon”), library, secondary school, North Vidzeme Biosphere Reserve Education Center) – Spring 2017
- large scale meeting – on-going (end of August 2017)
USE OF THE INDICATOR SYSTEM AS THE ESE MODEL
DIFFERENT RANGES OF PARAMETERS FOR MONITORING

- **Indicators**: long-term processes, maybe objectives too; quantitative
- **Resultative pointers**, the achievement of objectives; quantitative
- **Semi-quantitative parameters**: ranged observations (for example, in scale «It is not found-A little-Average-Totally»)
- **Resultative pointers**, checklist type («Yes/No»)
Parameter or commonly interpretable group of parameters can be defined as indicator of the governance of sustainable development if it/they are considered as subsequent and **mutually comparable numerical values** and which reflect the goals of governance, sustainable values and the change of these values in course of time and which:

- allow to judge about system to be governed and the condition and tendencies of its components, including comparison among system’s parts and/or in comparison with other, similar systems,
- are directly or indirectly affected by administration decisions in respective level of governance,
- provide principal information for the needs of the governance decision making process,
- are approved by appropriate governance decision.
DEVELOPMENT OF MUNICIPAL COASTAL MONITORING SYSTEM

- System-dynamic model of the coast: 40 parameters
- SD indicator system proposal: 31 indicator with 83 parameters
- Mid-term resultative pointers: 39 parameters
- Public monitoring «citizen science» parameters: 6 parameters
- Coastal sustainable development governance indicators: 56 parameters
- Municipal monitoring system:
  - SD indicator subsystem: 33 parameters
  - Public monitoring subsystem: 15 parameters
  - Other development pointers: 32 parameters
  - Total 70 parameters
CIS is structured firstly by main components of sustainability (nature, economics, social environment, governance, integral indicators). Each indicator included in the CIS has passed review on its disciplinary area of expertise. The following disciplinary parts are included in the CIS:

- coastal nature and environmental quality,
- coastal economics
- coastal lifestyle.

The interlinkage of different parts of CIS to reflect interdisciplinary character of coastal area has been done by introducing within the CIS the part of integral indicators.
The CIS as a whole complex system thus

- describes state of the coastal area, stability of both coastal ecosystem and coastal socio-economic system, and their restorative potential and participatory functions.
- Regarding the participatory function, the CIS presents the main stakeholder concerns through the key parameters of the coastal state which can be improved within the collaborative governance scenario by stakeholders participation.
- The set of indicators, included in the CIS, are both necessary and sufficient to be sure they represent adequately the coastal system functionality and impacts of actions performed in coastal area and can produce reasonable view on coastal and coastal governance state and dynamics taking into account known defined limitations and conditions. This reasonability are provided both by the chosen structure of the CIS and the chosen data collection & processing, and analysis methods.
Regarding the application area of the CIS, all three areas below are valid:

• the CIS relates to public policy,
• the CIS relates to the occurrence of natural events and long-term change – by inclusion in the CIS the indicators characterising the climate change,
• the CIS relates to the interactions between nature and the society – the stakeholders may identify the impact of the increase of a specific type of human activity through the overall change of the state in the coastal area.
SET OF COASTAL GOVERNANCE TOOLS
Layout of Coastal Governance Tools
Elaborated

- Salacgriva Municipality Coastal Governance Thematic Report: Content Guidelines
- Coastal sustainable development collaborative monitoring system in Salacgriva Municipality
- Outline of Public Monitoring Programme (*citizens science*)
- Recommendations for coastal thematic spatial planning

*They are definitely innovations for Latvia coastal governance practice*

*All tools are not only separate tools but also integrative coastal governance instruments, application of which might give significant input in the development of coastal action plan*
**ICZM Research: ICZM Model Guidelines**

**STEPS OF SAF:**
1. Issue identification
2. System Design
3. System Formulation

**SAF System model: elements and interlinkages**

**GOVERNANCE SCENARIOS**
1. Base scenario
2. Top-down governance scenario
3. Bottom-up governance scenario
4. Collaborative Governance Scenario

**The System Model Elements and Interlinkages Serve as Background for Report Content and Content of other Products**

**Decision on scenario done by Reference group**

**Collaborative Scenario Chosen**

**Definition of the Governance elements of the Collaborative Governance Scenario**

**COASTAL THEMATIC REPORT**

**MUNICIPAL COASTAL COLLABORATIVE MONITORING PROGRAMME**

**MUNICIPAL COASTAL AND DEVELOPMENT INDICATORS SYSTEM**

**COASTAL THEMATIC SPATIAL PLANNING**

**SET of COASTAL GOVERNANCE INSTRUMENTS and ACTION PLAN**

**LOCAL INNOVATION S: complementary**

**SAF SYSTEM MODEL is the BASE**

**Coastal Governance Scenarios are incorporated**
Statically part and dynamical part

Statically part - represented by the snapshot of the parameters of coastal system dynamic model (CSDM)

Dynamical part - represented by the Coastal sustainability indicators system (CIS)

Qualitative and quantitative part

Quantitative part – described by the CIS

Qualitative part – illustrated by main qualitative relationships of the CSDM, as it not possible describe by the CIS
<table>
<thead>
<tr>
<th>Nr.</th>
<th>Referable development goal by Salacgrīva district SDS</th>
<th>Parameter</th>
<th>Target value 2030 or trend</th>
<th>Coastal zone definition</th>
<th>Source of parameter</th>
<th>Data source</th>
<th>Period of measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spatial and functional assurance of coastal accessibility</td>
<td>The total length of tracks in the dune area, km</td>
<td>[increases]</td>
<td>Coastal PZ; by SP</td>
<td>SDS, SDM (mod.)</td>
<td>Municipalit y Council</td>
<td>Annual</td>
</tr>
<tr>
<td>2</td>
<td>Exit points at the sea, which are fixed in nature, % from indicated in SP</td>
<td>100</td>
<td></td>
<td>Coastal PZ; by SP</td>
<td>SDS, DP</td>
<td>Municipalit y Council, PM</td>
<td>Annual</td>
</tr>
<tr>
<td>3</td>
<td>Exit points at the sea, which are suitable for disabled people, % from all the real</td>
<td>100</td>
<td></td>
<td>Coastal PZ; by SP</td>
<td>SDS, DP</td>
<td>Municipalit y Council, PM</td>
<td>Annual</td>
</tr>
<tr>
<td>4</td>
<td>Climate change and adaptation to the reinforced natural risks</td>
<td>Photo documentation of coastal processes</td>
<td>n/a</td>
<td>Coastal dune PZ</td>
<td>Expert</td>
<td>PM</td>
<td>Annual</td>
</tr>
<tr>
<td>5</td>
<td>Monitoring of wintering aquatic birds</td>
<td>[not decreases]</td>
<td></td>
<td>Shoreline</td>
<td>Expert</td>
<td>PM</td>
<td>Annual</td>
</tr>
<tr>
<td>6</td>
<td>Risks reduction caused by transport flows and related to it</td>
<td>Illegal motor vehicle entrance in the dune zone, cases per year</td>
<td>[decreases]</td>
<td>Coastal dune PZ</td>
<td>SDS</td>
<td>Municipalit y Council, PM</td>
<td>Annual</td>
</tr>
<tr>
<td>7</td>
<td>Planning and creation of coastal environmental infrastructure</td>
<td>The number of public toilets in the dune zone or in the vicinity</td>
<td>[optimal]a</td>
<td>Coastal dune PZ</td>
<td>SDS, SDM</td>
<td>Municipalit y Council, HI, REB</td>
<td>Annual, at season</td>
</tr>
<tr>
<td>8</td>
<td>Coastal environmental quality (in the SDS targets indirectly)</td>
<td>Marine litter, number of items</td>
<td>[decreases]</td>
<td>Beach</td>
<td>SDM</td>
<td>PM: project „My Sea“</td>
<td>Annual</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Bathing water quality, % of the guided and mandatory values</td>
<td>90 and 100</td>
<td>Coastal PZ in the sea – bathing places; by SP</td>
<td>SDS, SDM (mod.), DP</td>
<td>HI</td>
<td>Annual</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Distribution of invasive species in terrestrial part of the dunes</td>
<td>[decreases]</td>
<td>Coastal PZ; by SP</td>
<td>Expert</td>
<td>PM</td>
<td>Annual</td>
</tr>
<tr>
<td>Position in action or investment plan</td>
<td>Measure or parameter to be monitored</td>
<td>Measured unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SM1 United, active, socially secured and intelligent society</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VTP1.1. Effective governance</td>
<td>Participation of council staff in professional development events</td>
<td>number</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Office building construction of Salacgriva port authority</td>
<td>completed; fact</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inhabitants satisfaction with governance</td>
<td>% of positive satisfaction in inhabitant groups</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cooperation projects with other coastal municipalities in Latvia and abroad</td>
<td>number</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Developed new municipality spatial plan</td>
<td>taken decision about approval</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resources spent in support programs</td>
<td>EUR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VTP 1.2. Diverse education</td>
<td>Established professional education program</td>
<td>marking on fact</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased qualification of education, culture and sport specialists of municipality</td>
<td>number</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resources spent in support programs</td>
<td>EUR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VTP1.3. Cultural environment</td>
<td>Resources spent in support programs</td>
<td>EUR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VTP1.4. Physically active and healthy lifestyle</td>
<td>Summer and winter sports equipment available for rental</td>
<td>marking on fact</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resources spent in support programs</td>
<td>EUR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LEVELS OF APPLICATION OF COASTAL INDICATORS SYSTEM

(1) **strategic level** – application of the full CIS. The measurements shall be done each 2 years for very dynamic indicators and 5+ years for the indicators with lower dynamic. The main obstacles for implementing the full scale CIS is high requirements for costs and human resources (compared to the existing availability of them in rural coastal municipality). Thus, the implementation of full scale CIS should be understood as the medium/long term objective.

(2) thus, in the short term period the **tactical level** of coastal monitoring shall be implemented. Its means monitoring of indicators, highly relevant for characterization of change in the coastal area – it should be monitored the minimal required set of indicators to identify in due time the changes in the coastal area. Important, the measurements of them might be done at reasonable costs and by both municipal specialist and local communities (citizens science) efforts. At the noted tactical level the selected indicators should be measured each year. Important, the tactical level monitoring shall be done in close relation with the actual development targets of the municipality,

(3) the **operative level** means the observation of the processes within critical coastal areas, which should/might be done sezonally or even each month, if critical influence might be expected. Both municipal specialists and local coastal inhabitants should be included in the programme of the observation; the obtained data should be quickly processed and analysed, and based on it, the operative coastal management/governance decisions should be decided and implemented in due time.
OUTLINE OF PUBLIC MONITORING PROGRAMME (CITIZENS SCIENCE)

NATURE
• Photo documentation of coastal processes
• Monitor of the state and trends of coastal dune fortifications.
• Coastal accumulation/erosion areas
• Locations of Washed ashore algae for assessment of beach quality and their further management
• Distribution of invasive species in terrestrial part of the dunes.
• Monitoring of wintering aquatic birds.
• Public Monitoring Programme on Marine Litter
• Illegal motor vehicle entrance in the dune zone,
• Small river ecological quality by bioindication

COASTAL GOVERNANCE
• Equipt sites
• Exit points at the sea, which are fixed in nature
• Exit points at the sea, which are suitable for disabled people
• Number of waste containers and bins
• Supported NGO driven projects number and total financing, thsd. EUR (NGOs involvement)
• Inhabitants satisfaction with the coastal governance (NGOs involvement)
Integration with and within:

- municipal long-term sustainable development strategy
- municipal medium-term development programme
- municipal short term action plan
- municipal spatial planning programme