Climate Strategy & Action Plan
Republic of Serbia

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Climate Change Adaptation Options
Report of stakeholder workshop for the Water Sector

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Authors: Gonçalo Cavalheiro, Rebeca Froese,
Jeremy Carter, Tina Dasic

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1 GENERAL DISCUSSIONS AND FINDINGS

The meeting aimed to acquire stakeholder input for the assessment of the risks associated with sector specific climate change impacts and to create a short list of measures to address the highest risks as assessed during the workshop. The ultimate goal of the meeting was, to identify three priority adaptation measures for the sector, which will now enter the planning stage.

The stakeholder engagement is foreseen as an element of the second stage of the Adaptation Planning Framework (APF), which is being developed in the Climate Strategy and Action Plan project. Stakeholder engagement is essential to the APF as the expertise of relevant Serbian individuals and organisations is needed in order to assess climate change risks and potential adaptation measures.

The APF is a user friendly tool currently under testing and development, which provides a step by step guide focused on assessing the risks associated with climate change and related extreme weather impacts and identifying and prioritising adaptation options to reduce key risks. It will be made available in 2018.

The APF is divided in four stages, as shown in figure 1. The stakeholder assessment reported in this document is part of stage two.

Figure 1 – The stages of the Adaptation Planning Framework

The stakeholder workshop started with a brief presentation to frame the meeting within the scope of the project “Climate Strategy and Action Plan. The presentation also highlighted that the strategy will be focused mostly on mitigation (measures to reduce greenhouse gas emissions), but that it will also include specific adaptation measures for three priority sectors: water resources – hydroelectricity production; forestry – bioenergy production; agriculture – food production.

Stakeholders questioned the reasoning behind selecting hydroelectricity production as the focus for the water sector, as this does not reflect the highest priorities in sectoral national policy, namely the Water Strategy.
The project team, supported by the Ministry of Environmental Protection (MEP), noted that the Climate Strategy and Action Plan are mostly focused on mitigation and that adaptation is not being treated in a comprehensive manner. In this regards, the priority sectors and respective focuses were determined previously as outlined in the project Terms of Reference (ToR) and therefore cannot be changed. The team incentivized participants to continue participating in the project activities, namely in the stakeholder engagement and public consultation activities, including for the Strategic Environmental Assessment (SEA), in order to ensure their concerns are reflected. The team promised to do so, while noting that planning of specific adaptation measures would only be done for the priority sectors as determined by the project ToR.

Following this discussion, Tina Dasic, the project expert on water resources, briefly introduced the topic by highlighting the key climate and climate change drivers as contained in Serbia’s Second National Communication (SNC). She also listed the adaptation measures included in the SNC for the sector.

Stakeholders were then invited to assess the severity of the consequences of the identified climate change impacts. The methodology was explained and stakeholders cast their votes for each impact.

The project team provided the assessment of likelihood based on the information contained in the SNC while stakeholders assessed only the consequences of climate change and extreme weather impacts to the forestry sector. (See next session for more detailed information).

After the risks were assessed, the project team examined the suggested adaptation measures provided in the experts presentation and simplified the list to only include adaptation measures, which addressed the highest risks. Participants were then invited to evaluate each measure from the short list, taking into account a proposed set of evaluation criteria (see below for further details).

The meeting was closed with the team thanking the stakeholders for their extremely valuable inputs from the participants and promising to send a meeting report and a satisfaction questionnaire by the end of the week.
2 OUTCOMES OF DISCUSSION ON RISK ASSESSMENT

Participants were asked to assess the risk associated with the following impacts of climate change:

- Impact Group 1: Reduced Flow and Flow irregularity. Likelihood: 4
  - I.1.1 - Change in annual and seasonal working patterns of HPPs
  - I.1.2 - Decrease quantity of water for hydropower production, due to fact that higher priority sectors need more water (domestic water supply, irrigation, environmental flow)

- Impact Group 2: Increasing air temperature. Likelihood: 4
  - I.2.1 - Increase of surface evaporation, reducing water storage and power output

- Impact Group 3: Extreme precipitation events. Likelihood: 1
  - I.3.1 - Increased erosion and siltation can reduce reservoir storage capacity
  - I.3.2 - Energy loss during floods

The assessment of likelihood was proposed by the team (as noted above), in accordance with the following definition and scale:

**Likelihood scale** – this represents the likelihood that a severe hazard event will occur under the selected climate change scenario (IPCC A2) and at the future time period (2050) that the risk assessment is focused on:

- 1 – Low (Very unlikely that the hazard event will occur)
- 2 – Moderate (Hazard event as likely to occur as not)
- 3 – High (Likely that the hazard event will occur)
- 4 – Very high (Virtually certain that the hazard event will occur)

After considering the likelihood assessment proposed by the team, stakeholders recommended that the likelihood of extreme precipitation events was assessed as 3 due to the availability of recent research on projections for this hazard event in Serbia.

With that being agreed, stakeholders were then asked to assess the severity of consequences of the identified climate change impacts, using the following definition and scale:

**Consequence scale** – this represents the severity of the consequences associated with climate change and extreme weather related impacts being considered within the risk assessment. This assessment should be based around the consideration of a reasonable worst case scenario (i.e. the hazard event impacting on the sector is a major one)

- 1 – Low (The impact has little or no negative implications to the sector)
- 2 – Moderate (The impact has some negative implications to the sector, but there are at a scale that can be managed enabling key functions to continue)
- 3 – High (The impact has widespread negative implications to the sector, which in some cases may lead to sustained loss of key functions)
- 4 – Severe (The impact has major negative implications to the sector which in some cases may lead to complete loss of key functions)
The results of the stakeholder assessment of risks of climate change impacts are shown in the following matrix:

**Figure 2 – Stakeholder determined climate change impact risk matrix**

![Figure 2](image)

Taking into account the results of the risk assessment above, a short list of adaptation measures was created, drawing on the measures from the long list that addresses the impacts identified as having the highest risks. According to Figure 2, impacts that have a very high likelihood and a high severity are located in the red zone, which is assessed as the zone with the highest risk. Those impacts are: 3.1 (Increased erosion and siltation can reduce reservoir storage capacity); 1.1 (Change in annual and seasonal working patterns of HPPs); 1.2 (Decrease quantity of water for hydropower production, due to fact that higher priority sectors need more water (domestic water supply, irrigation, environmental flow)) and 2.1 (Increase of surface evaporation, reducing water storage and power output).

The short list of measures is as follows:

1. Due to the need for a manageable number of measures to be evaluated in the workshop, the team decided to include in the short list only the structural/physical measures (as classified in the Second National Communication).

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1. Due to the need for a manageable number of measures to be evaluated in the workshop, the team decided to include in the short list only the structural/physical measures (as classified in the Second National Communication).
1. Construction of barriers to torrential floods
2. Increase in water storage capacity
3. Pumped storage HPPs
4. Increase in installed power of HPPs
5. Planning small HPPs at the vicinity of the existing dams (to utilize ecological flows),
6. Utilization of mathematical models for optimal operation of HPPs,
7. Improvement of the early warning systems for extreme climate and hydrological events

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2 None of the measures in the Second National Communication addressed the highest risk identified. With that in mind, this measure was proposed during the workshop.
3 OUTCOME OF EVALUATION OF MEASURES IN SHORT LIST

Stakeholders were invited to evaluate each of the measures in the short list based on the evaluation approach presented in Table 1. Stakeholders were also asked to determine the weight of each criteria.

Table 1 – Criteria for evaluation of adaptation measures

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description of criteria</th>
<th>Weight</th>
<th>Scoring the options against the criteria</th>
</tr>
</thead>
</table>
| Effectiveness| How effective is the adaptation option in reducing the target impact?                    | 3      | 1 – No evidence it reduces the target impact  
2 – Limited evidence it can reduce the target impact  
3 – Proven to reduce the target impact                      |
| Efficiency   | Do the benefits of the adaptation option exceed any associated costs?                    | 3      | 1 – Benefits unlikely to exceed costs  
2 – Benefits likely to exceed costs  
3 – Benefits significantly exceed costs                          |
| Mitigation   | Does the adaptation option support or conflict with the achievement of mitigation goals? | 2      | 1 – Conflicts with the achievement of mitigation goals  
2 – Potential to support the achievement of mitigation goals  
3 – Strongly supports the achievement of mitigation goals        |
| Urgency      | Is the target impact that the adaptation option aims to reduce already being experienced?| 2      | 1 – No experience of the impact  
2 – Isolated records of the impact  
3 – Impact regularly experienced                                  |
| Multifunctionality | Does the adaptation option generate other benefits in addition to addressing the target impact? | 3      | 1 – Solely addresses the target impact  
2 – May generate several benefits in addition to addressing the target impact  
3 – Will generate a range of benefits in addition to addressing the target impact |

Stakeholders were asked to evaluate each measure along the five criteria described in Table 1. The weight of the criteria was determined based on inputs from stakeholders and expert validation (given that not all stakeholders proposed weights for the criteria) and is reflected in Table 1. The results were obtained by multiplying the scores for each of the measures from 1 to 3 with the weighting factor of the criteria. The scores achieved for each measures are presented in Table 2.
The ranking of the measures based on the stakeholder evaluation is as follows:

**Table 2 – Ranking of short list measures**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Measure</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Improvement of the early warning systems for extreme climate and hydrological events</td>
<td>31,00</td>
</tr>
<tr>
<td>2</td>
<td>Construction of barriers to torrential floods</td>
<td>30,27</td>
</tr>
<tr>
<td>3</td>
<td>Utilization of mathematical models for optimal operation of HPPs</td>
<td>28,09</td>
</tr>
<tr>
<td>4</td>
<td>Increase in water storage capacity</td>
<td>27,18</td>
</tr>
<tr>
<td>5</td>
<td>Increase installed power of HPPs</td>
<td>26,82</td>
</tr>
<tr>
<td>6</td>
<td>Planning small HPPs at the vicinity of existing dams (to utilize ecological flow)</td>
<td>22,18</td>
</tr>
<tr>
<td>7</td>
<td>Pumped storage HPPs</td>
<td>22,00</td>
</tr>
</tbody>
</table>

Based on this outcome, the measures ranking 1, 2 and 3 will be proposed to move to stage 3 of the APF: Planning.
## ATTENDANCE LIST

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ratko Ristic</td>
<td>Faculty of Forestry, Belgrade – for water</td>
</tr>
<tr>
<td>2</td>
<td>Jasna Plavsic</td>
<td>Faculty of Civil Engineering, Dpt. for Hydraulic and Envir.Engineering</td>
</tr>
<tr>
<td>3</td>
<td>Dusica Trnavac Bogdanovic</td>
<td>Young researches of Serbia, voluntary service</td>
</tr>
<tr>
<td>4</td>
<td>Miodrag Milovanovic</td>
<td>The Jaroslav Cerni Institute for the Development of Water Resources</td>
</tr>
<tr>
<td>5</td>
<td>Jovana Dragic May</td>
<td>Coalition 27</td>
</tr>
<tr>
<td>6</td>
<td>Milos Ivetic</td>
<td>“Energoprojekt” – hydro-engineering</td>
</tr>
<tr>
<td>7</td>
<td>Bratislav Poprasic</td>
<td>Ecology center of city Krusevac</td>
</tr>
<tr>
<td>8</td>
<td>Vladimir Djurdjevic</td>
<td>Institute of meteorology, Faculty of Physics</td>
</tr>
<tr>
<td>9</td>
<td>Ognjen Pantic</td>
<td>Belgrade Open School - Energy, Climate and Environment</td>
</tr>
<tr>
<td>10</td>
<td>Ana Repac</td>
<td>Ministry of Environmental Protection, CC Unit</td>
</tr>
<tr>
<td>11</td>
<td>Marko Ilic</td>
<td>Ministry of Environmental Protection, CC Unit</td>
</tr>
<tr>
<td>12</td>
<td>Aleksandar Popovic</td>
<td>Ministry of Environmental Protection, CC Unit</td>
</tr>
<tr>
<td>13</td>
<td>Snezana Kuzmanovic</td>
<td>Ministry of Environmental Protection</td>
</tr>
<tr>
<td>14</td>
<td>Tina Dasic</td>
<td>Climate strategy and Action Plan, Water Adaptation Expert</td>
</tr>
</tbody>
</table>