1. Ocean Services Technology Observation Resources Modelling & Sciences (O-STORMS) (CS) re-designated as Ocean Services, Modelling, Applications, Resources and Technology (OSMART)

<table>
<thead>
<tr>
<th>FINANCIAL OUTLAY (Rs in Cr)</th>
<th>OUTPUTS 2019-20</th>
<th>Targets 2019-20</th>
<th>Outcome</th>
<th>INDICATORS</th>
<th>Targets 2019-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>483</td>
<td>1. Improved Safety at sea and in coastal areas</td>
<td>4 buoys</td>
<td>1.a Coverage expansion and improvement of coastal water monitoring</td>
<td>1.1. No of hotspots under coastal water quality monitoring system</td>
<td>4 locations</td>
</tr>
<tr>
<td></td>
<td>1.1. No of buoys to be commissioned for Marine Observation along Indian Coast - Coastal buoys</td>
<td></td>
<td>1.b Augmentation of data would help in better predication of ocean disasters</td>
<td>1.2. Improve the lead time of prediction of cyclones</td>
<td>72 hours</td>
</tr>
<tr>
<td></td>
<td>1.2. Augmentation in the no. of observation systems as a part of the multi-hazard warning system-Moored Buoys</td>
<td>19 buoys</td>
<td>1.c Increased lead time for enabling timely response on emergency advisories</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.3. No. of tsunami buoys -Operational</td>
<td>7 buoys</td>
<td></td>
<td>1.3. Improve issue of early warning of tsunamis &amp; Time taken (Average/Highest/Lowest) to issue tsunami advisories</td>
<td>10 minutes</td>
</tr>
<tr>
<td></td>
<td>2. Coastal states monitoring</td>
<td>2.50 km</td>
<td>2.a Improve in coastal inundations</td>
<td>2.1. Increase in resolution of inundation models</td>
<td>2.5 km</td>
</tr>
<tr>
<td></td>
<td>2.1. Increase in the resolution of the real-time inundation model</td>
<td></td>
<td>2.b Issuance of weather and fishery advisories to support fishing</td>
<td>2.2. Assessment of health of the coastal waters of India</td>
<td>8 coastal states</td>
</tr>
<tr>
<td></td>
<td>2.2. Number of locations for monitoring of coastal pollution</td>
<td>20</td>
<td></td>
<td>2.3. Assess the shoreline changes of the Indian Coast</td>
<td>7 coastal</td>
</tr>
<tr>
<td></td>
<td>2.3. No of states where Coastal Erosion is</td>
<td>6 coastal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FINANCIAL OUTLAY (Rs in Cr)</td>
<td>OUTPUTS 2019-20</td>
<td>OUTCOME 2019-20</td>
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<tr>
<td></td>
<td>Output</td>
<td>Indicators</td>
<td>Targets 2019-20</td>
<td>Outcome</td>
<td>Indicators</td>
</tr>
<tr>
<td></td>
<td></td>
<td>being monitored</td>
<td>states</td>
<td>industry</td>
<td></td>
</tr>
<tr>
<td>2.4. No. of registered mobile user of fisherman community</td>
<td>2</td>
<td>2.4. New system setup for species specific advisory services as well as potential fishing zone assessment services</td>
<td>2</td>
<td>5 lakhs</td>
<td></td>
</tr>
<tr>
<td>2.5. Economic benefits generated from ocean advisory services</td>
<td>300</td>
<td>2.5. No. of fisheries advisories issued</td>
<td>300</td>
<td>Rs.35,000 crore</td>
<td></td>
</tr>
<tr>
<td>2.4.</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Exploration of Marine resources (a) Underwater living resources - Marine Species (b) Underwater Non-living resources - e.g. minerals</td>
<td>3</td>
<td>3.1. Area covered under bathymetric data acquisition in exclusive economic zone of India (sq. km.)</td>
<td>1.00 lakh sq.km.</td>
<td>3.1. % of total west coast of India covered</td>
<td>90%</td>
</tr>
<tr>
<td>3.2. Conducting biogeochemistry studies on the west coast of India</td>
<td>3</td>
<td>3.2.</td>
<td>3.3.56%</td>
<td>68%</td>
<td>3.3. % of 2.2 million Sq. km. of Exclusive Economic Zone explored</td>
</tr>
<tr>
<td>4. Replacement of Ocean Research Vessels</td>
<td>4</td>
<td>4.1. % ocean research vessels outlived their designed life/needs replacement (2/5)</td>
<td>40%</td>
<td>4.1. No. of publications in peer reviewed journals</td>
<td>20</td>
</tr>
<tr>
<td>5. Commissioning of OTEC powered Desalination plants</td>
<td>5</td>
<td>5.1. Selection of site of the OTEC powered Desalination plants (Yes/No)</td>
<td>Yes</td>
<td>5.1. No. of OTEC plants set up</td>
<td>*</td>
</tr>
</tbody>
</table>

*Targets for this indicator are not amenable*
### 2. Atmosphere & Climate Research - Modelling Observing Systems & Services (ACROSS) (CS)

<table>
<thead>
<tr>
<th>FINANCIAL OUTLAY (Rs in Cr)</th>
<th>OUTPUTS 2019-20</th>
<th>OUTCOME 2019-20</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Targets 2019-20</td>
<td>Outcome Indicators</td>
</tr>
<tr>
<td>2019-20</td>
<td>Output</td>
<td>Targets</td>
</tr>
<tr>
<td></td>
<td>Output</td>
<td>Targets</td>
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<tr>
<td></td>
<td>Indicators</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Targets</td>
<td></td>
</tr>
<tr>
<td>2019-20</td>
<td>Output</td>
<td>Targets</td>
</tr>
<tr>
<td></td>
<td>Indicators</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Targets</td>
<td></td>
</tr>
<tr>
<td>2019-20</td>
<td>Output</td>
<td>Targets</td>
</tr>
<tr>
<td></td>
<td>Indicators</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Targets</td>
<td></td>
</tr>
</tbody>
</table>

**1. Setting up of District Agro meteorological Field Units**
- Number of District Agro meteorological Field Units (DAMU) established: 390
- Issuance of Weather, Climate and Agro meteorological advisories: 5 crore farmers

**2. Augmentation of the Observation System Network**
- Installation and commissioning of Radars and Aviation Weather Observing System (AWOS) and Automatic Weather Stations (AWS) at DAMU and in 400 cities:
  - Radars (X-Band): 10
  - Radars (C-Band): 11
  - AWOS: 10
  - HAWOS: 5
  - Agro AWS: 200
  - AWS: 400
- State-of-the-Art support system for Aviation safety with the AWOS and advanced Forecasting tools at the civil airports in the country. Better forecasting capability for NW Himalayan region by commissioning of X-Band DWRs and Increase in Nowcasting Capabilities by Installation of C Band Radars:
  - Frequency of issuance of weather advisories: Every 3hrs
  - Increase in Number of Nowcast Stations: 600

**3. Climate Services**
- Establishment of state-of-the-art climate data centre with integrated advanced climate data services portal for rendering national and regional climate:
- Improved Climate Services
- Development State-of-art systems for all data management and Climate services on sectoral applications (Disaster, Water, Health, etc..): Yes

**FINANCIAL OUTLAY (Rs in Cr)**

413
<table>
<thead>
<tr>
<th>FINANCIAL OUTLAY (Rs in Cr)</th>
<th>OUTPUTS 2019-20</th>
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<tbody>
<tr>
<td></td>
<td>Output</td>
<td>Indicators</td>
</tr>
<tr>
<td></td>
<td></td>
<td>services(Yes/No)</td>
</tr>
<tr>
<td>Global Ensemble Weather</td>
<td>resolution of Global</td>
<td></td>
</tr>
<tr>
<td>Forecasting System</td>
<td>Ensemble Prediction System for the generation of Probabilistic Forecasts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.2. Development of new applications</td>
<td>1</td>
</tr>
<tr>
<td>5. Development of</td>
<td>5.1. No. of Coordinated Climate model experiments under Coupled Model Intercomparison Project (CMIP) of the World Climate Research Programme (WCRP)</td>
<td>1500</td>
</tr>
<tr>
<td>Earth System model</td>
<td></td>
<td></td>
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192
<table>
<thead>
<tr>
<th>FINANCIAL OUTLAY (Rs in Cr)</th>
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<td>Indicators</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>Computing system</td>
<td>for HPC upgradation.</td>
</tr>
<tr>
<td></td>
<td>– V3.0</td>
<td>(Yes/No)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.2. Installation and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>commissioning of the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High Performance Computing System</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V3.0 (Yes/No)</td>
</tr>
<tr>
<td>7.</td>
<td>Establishment of</td>
<td>7.1. Publishing the RFP for the procurement</td>
</tr>
<tr>
<td></td>
<td>National Facility</td>
<td>of Instrumented Aircraft System (IAS)</td>
</tr>
<tr>
<td></td>
<td>for Airborne Research (NFAR)</td>
<td>(Yes/No)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.2. Identification of hangar land at Aurangabad airport</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Yes/No)</td>
</tr>
</tbody>
</table>

3. Polar Sciences Cryosphere (PACER) (CS)

<table>
<thead>
<tr>
<th>FINANCIAL OUTLAY (Rs in Cr)</th>
<th>OUTPUTS 2019-20</th>
<th>OUTCOME 2019-20</th>
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<tbody>
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</table>

resolution atmospheric version of IITM-ESM) by the end of March 2020 (Yes/No)
<table>
<thead>
<tr>
<th>2019-20</th>
<th>Output</th>
<th>Indicators</th>
<th>Targets 2019-20</th>
<th>Outcome</th>
<th>Indicators</th>
<th>Targets 2019-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Scientific Expeditions</td>
<td>1.1. 13th Scientific expedition to the Arctic launched</td>
<td>1</td>
<td>1. Improved contribution of India to international polar research arena</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.2. 39th scientific expedition to the Antarctic launched</td>
<td>1</td>
<td>1.2. No of parameters recorded during 39th expedition</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.3. No. of scientific expeditions to Himalayas</td>
<td>1</td>
<td>1.3 No of Publications related to Indian Monsoons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Initiation of scientific projects in cryospheric, atmospheric and geosciences domain</td>
<td>2.1. Multi-disciplinary inter-institutional scientific expedition to Southern Ocean including the Tropical Indian Ocean (TCO) launched</td>
<td>1</td>
<td>2. Improved understanding of glacier dynamics</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.2. No. of scientific projects launched in polar region</td>
<td>70</td>
<td>2.1 No of glaciers monitored in Himalayas</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Acquisition of Polar research vessels</td>
<td>3.1. Polar Research vessel - % of work in building PRV</td>
<td>10%</td>
<td>3. Enhance scientific capability to conduct polar research</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.1. No. of days where annual expeditions were interrupted</td>
<td></td>
<td></td>
<td>*</td>
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</tr>
</tbody>
</table>

*Targets for this indicator are not amenable*
### 4. Seismological & Geosciences (SAGE) (CS)

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>2019-20</td>
<td>1. Capacity augmentation for seismological observations</td>
<td>1.1. No. of seismological observatories commissioned in the country</td>
<td>115</td>
<td>1. Improvement in the earthquake detection capabilities with increased accuracy in earthquake parameters</td>
<td>1.1. Minimum detection threshold magnitude of earthquake within country</td>
</tr>
<tr>
<td></td>
<td>1.2. No. of seismological observatories to be commissioned in the Garhwal-Kumaon Himalaya for delineation of deep crustal structures and seismic coupling maps</td>
<td>*</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>1.3. Setting up of a national facility for geochronology i.e creation of required infrastructure to set up the Lab and procure ancillary equipment in % terms</td>
<td>40 %</td>
<td></td>
<td>2. Increased research base in seismological studies*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Setting up of borehole observatory in Koyna region</td>
<td>2.1. Processing, analysis and interpretation of geophysical data acquired from the pilot borehole drilled up to 3 km depth. Analysis and interpretation of geophysical datasets to identify active fault zone(s)</td>
<td>60%</td>
<td></td>
<td>2.3. Average Time lag in reporting earthquake occurring within country</td>
</tr>
<tr>
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<tr>
<td>115</td>
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<td>Targets 2019-20</td>
<td>Outcome</td>
<td>Indicators</td>
<td>Targets 2019-20</td>
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<td>---------------------------------------------------------------------------</td>
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<td>---------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>2.2. Processing, analysis and</td>
<td>2.2. Processing, analysis and interpretation of geophysical data acquired</td>
<td>60%</td>
<td></td>
<td>2.4. No. of registered users of SMS services app</td>
<td>500</td>
</tr>
<tr>
<td>interpretation of geophysical</td>
<td>from the pilot borehole drilled up to 3 km depth: % of Geo-Chemistry data</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>data acquired from the pilot</td>
<td>acquisition.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>borehole drilled up to 3 km</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>depth: % of Petrography Micro-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>structure of basement rock</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3. Processing, analysis and</td>
<td>2.3. Processing, analysis and interpretation of geophysical data acquired</td>
<td>70%</td>
<td></td>
<td>2.5. No. of registered users of mobile app services</td>
<td>5000</td>
</tr>
<tr>
<td>interpretation of geophysical</td>
<td>from the pilot borehole drilled up to 3 km depth: % of Petrography Micro-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>data acquired from the pilot</td>
<td>structure of basement rock</td>
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<tr>
<td>borehole drilled up to 3 km</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>depth: % of Petrography Micro-</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>structure of basement rock</td>
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</tr>
<tr>
<td>2.4. Seismological studies in</td>
<td></td>
<td>80%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Koyna region</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5. Planning of main borehole</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Yes/No)</td>
<td></td>
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<tr>
<td>(Depending upon the site clearance)</td>
<td></td>
<td></td>
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</tbody>
</table>

*Targets for this indicator are not amenable

5. Research Education & Training Outreach (REACHOUT) (CS)

<table>
<thead>
<tr>
<th>Output</th>
<th>Indicators</th>
<th>Targets 2019-20</th>
<th>Outcome</th>
<th>Indicators</th>
<th>Targets 2019-20</th>
</tr>
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<tbody>
<tr>
<td>2019-20</td>
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</tr>
</tbody>
</table>

196
<table>
<thead>
<tr>
<th>1. Extramural funding</th>
<th>1.1. Number of proposals funded for undertaking R&amp;D activities in various academic and research institutes of the country</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Outreach and awareness</td>
<td>2.1 Towards reaching out to the general public on the various services rendered by the ministry over 50 conferences/seminars/symposium will be organized.</td>
<td>50</td>
</tr>
<tr>
<td>3. Establishment of BIMSTEC centre at Noida and UNESCO Category-2 centre of ITCOcean at Hyderabad</td>
<td>3.1 No. of courses launched in operational oceanography in collaboration with academic institutes/universities internationally</td>
<td>8</td>
</tr>
<tr>
<td>1. Nurturing the R&amp;D activities in Earth Sciences being undertaken in the various academic and research institutes of the country</td>
<td>1.1. No. of publications based on research conducted through extramural funding</td>
<td>50</td>
</tr>
<tr>
<td>2. Providing support to seminars, conferences, workshops, field programmes training activities etc. in the area of Earth System Science to provide platform to scientists, engineers, technologists, experts, social scientists and user communities for exchanging information and knowledge; and participation/support in exhibitions for awareness of MoES achievements/services of importance.</td>
<td>2.1 No. of people trained in short-term training programmes</td>
<td>30</td>
</tr>
<tr>
<td>2.2 No. of people trained in long-term training programmes</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>