Draft endorsed by the Sixth Session of APDIM Governing Council for further consultation. Comments to be sent to Ms Ava Bahrami via email at ava.bahrami@un.org by 15 March 2022.

Draft Regional Plan of Action on Sand and Dust Storms in the Asia and Pacific

Objective

This plan aims at providing a strategic framework and reference for countries in Asia and the Pacific region to take action at national and regional level to reduce the negative impact of sand and dust storms and identify anthropogenic measures that could contribute to, or mitigate, their formation and intensity.

Scope and Focus: Priority Areas at Regional and National Level

The priority areas highlighted in this plan have been informed by the Risk Assessment of Sand and Dust Storm Report as well as technical consultations held with member states, expert practitioners, United Nations organizations and other stakeholders on 6 December 2021, and [*additional dates to be included in the final draft after the Governing Council Meeting*].

This plan of action builds on, and reflects, existing relevant international frameworks and agreements – including the United Nations Convention to Combat Desertification, the Sendai Framework for Disaster Risk Reduction, the Sand and Dust Storm Warning Advisory and Assessment System of the World Meteorological Organization. The plan reflects ongoing relevant collaboration between the various UN development system organizations and member countries, including United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), the United Nations Coalition on Combatting Sand and Dust Storms, the secretariat of the United Nations Convention to Combat Desertification (UNCCD), the World Meteorological Organization (WMO), Food and Agriculture Organization (FAO), United Nations Office for Disaster Risk Reduction (UNDRR) and other key partners in the region.

Intergovernmental commitment to combat sand and dust storms

In recent years, a number of resolutions have been adopted requesting the ESCAP secretariat to support and facilitate disaster risk assessment to strengthen regional cooperation mechanisms as well as to combat the negative impact of sand and dust storms. In ESCAP resolution 71/12 of 29 May 2015 ESCAP member States requested the ESCAP secretariat to strengthen disaster risk modelling, assessment, mapping, monitoring and multi-hazard early warning systems of common and transboundary disasters. Subsequently, the General Assembly, in its resolution 70/195 of 22 December 2015 emphasized "the relevance of the efforts and cooperation of Member States at regional and international levels to control and reduce the negative impacts of sand and dust storms on human settlements in vulnerable regions". The same resolution also stressed "the need for cooperation at global and regional levels with a view to preventing and managing sand and dust storms through the development of early warning systems and the sharing of climate and weather information to forecast sand and dust storms and affirming that resilient action to combat sand and dust storms requires a better understanding of the severe multidimensional impacts of sand and dust storms, including the deterioration of the health, well-being and livelihood of people, increased desertification and land degradation, deforestation, loss of biodiversity and land productivity, and their impact on sustainable economic growth".

Furthermore, the General Assembly, through resolution 74/226 of 19 December 2019 encouraged "regional, subregional and interregional organizations and processes to continue to share best practices, experiences

and technical expertise in combating sand and dust storms to address the root causes and impacts of sand and dust storms, including through improved implementation of sustainable land management practices, and to promote regional cooperation in this matter to reduce the risks and impact of future sand and dust storms and to provide affected countries with capacity-building and technical support from the relevant United Nations organizations".

Sand and Dust Storms impact on sustainable development

As a meteorological phenomenon, sand and dust storms derive mainly from arid and semi-arid areas and are spread across large parts of the Asia and Pacific region. Major events can transport dust over great distances so that their impacts occur not only in the areas where they originate but also in communities far from the source areas, frequently across international boundaries.

Sand and dust storms directly affect sustainable development and as such their observation, risk assessment, including from an impact-based perspective, management and mitigation ought to be an integral component of national and regional efforts towards sustainable development.

Sand and dust storms can adversely impact poverty in a community in numerous ways, not least because sand and dust storms often represent a form of dryland degradation or desertification. Sand and dust storms have a negative impact on food security by intensifying the damages to the livelihood and food security of millions of small farmers and pastoralists, as well as by damaging agricultural infrastructure, directly impacting production. This, in turn, becomes a major limitation to the second sustainable development goal to end hunger by 2030. Achieving good health and well-being in communities can also be adversely impacted. Sand and dust storms represent a risk factor for chronic diseases such as lung cancer and acute lower respiratory infections, cardiovascular and respiratory diseases which result in premature death (UNEP, WMO, & UNCCD, 2016). The condition of people with diseases such as bronchitis, eye infections, skin irritations, meningococcal meningitis, valley fever and diseases associated with toxic algal blooms is also impacted over time. An increase in the level of sand and dust in the environment and water resources will adversely affect water quality. In the long term, this will lead to difficulties in providing safe and affordable drinking water for all. Moreover, the economic growth of a community might be affected by sand and dust storms. They can severely damage crops, fill irrigation canals, trigger power blackouts and result in other damage. Power, water, road and other important infrastructure failures might occur as a result of sand and dust storms which can interrupt the provision of vital and critical services for the community. All these impacts can affect the sustainability and resilience of infrastructure and small and big businesses. Sand and dust storms can severely impact cities and other communities, hampering their efforts to become inclusive, safe, resilient and sustainable. Climate change and changes in temperature and precipitation levels are modifying sand and dust storm hazard levels and increasing the associated risks. Due to changes in climate conditions, many drylands are becoming drier and consequently more prone to wind erosion and sand and dust storms. Life below water and on land are directly and indirectly affected by sand and dust storms in both a positive and negative way. Sand and dust deposition in coastal areas adversely affect coral reef ecosystems and life below water. The resilience of communities on land is undermined by many of the risks associated with sand and dust storms. Sand and dust storms also threaten the means of implementation and revitalization of the global partnership for sustainable development because of the extensive and intensive socio-economic losses they can trigger.

11 of the 17 SDGs are directly impacted by sand and dust storms.

- Ending poverty in all forms (SDG 1)
- Ending hunger (SDG 2)
- Good health and well-being (SDG 3)
- Safe water and sanitation (SDG 6)
- Affordable and clean energy (SDG 7)
- Decent work and economic growth (SDG 8)
- Industry innovation and infrastructure (SDG 9)
- Sustainable cities and communities (SDG 11)
- Climate action (SDG 13)
- Life below water (SDG 14)
- Life on land (SDG 15)

Sand and Dust Storms Risk Assessment in Asia and the Pacific

Pursuant to ESCAP resolution 72/7 of 19 May 2016, which requested the ESCAP secretariat to, inter alia, accord priority focus on the work of the Commission relating to sand and dust storms as a great transboundary challenge and promote regional and interregional networking on sand and dust storms, APDIM conducted the ***Sand and Dust Storms Risk Assessment in Asia and the Pacific*** to provide a long-term horizon of the risk and potential socio-economic losses and impact associated with sand and dust storms. The report is the first attempt to assess and analyse the risks posed to society and the environment by sand and dust storms in such a large-scale geographical area. It was the product of collaboration, active support and contributions from other United Nations entities and subsidiary bodies of ESCAP, national agencies, research institutions and universities all over the world.

The risk of sand and dust storms was analysed as a function of hazard, vulnerability, and resilience; vulnerability being a function of sensitivity and exposure. The assessment covered several sectors, including human health, transport, energy, agriculture, and environment with a trans-boundary approach at a regional scale. To assess the risk – indicators and layers for each of the components of risk for each sector were selected. At an early stage in the risk assessment, APDIM evaluated the evidence for the risks posed by sand and dust storms to all aspects of society, economy, and environment. This evaluation involved an appraisal of the knowledge and understanding of impacts as well as the availability of relevant data. The required data for the *Sand and Dust Storms Risk Assessment* were gathered by APDIM through direct collaboration with organizations including the Finnish Meteorological Institute, the International Air Transport Association (IATA), Japan Meteorological Agency (JMA), World Meteorological Organization (WMO), Sand and Dust Storm Warning Advisory and Assessment System Network, the China Meteorological Administration, Statistics, Energy, and Transport Divisions of ESCAP. A number of open-source data were used, including the National Aeronautics and Space Administration (NASA) Global Modelling and Assimilation Office (GMAO) Modern-Era Retrospective analysis for Research and Applications, version 2, NASA Socioeconomic Data and Applications Centre, and the Global Land Cover by National Mapping Organizations of Geospatial Information Authority of Japan, Chiba University and collaborating organizations. Additional data was gathered by APDIM from the subsidiary bodies of ESCAP including Information and Communication Technology and Disaster Risk Reduction, Statistics, Transport and Energy Divisions. The Food and Agriculture Organization of the United Nations (FAO), and the International Air Transport Association (IATA) also contributed important data sets. The sand and dust

storms reanalysis data were gathered from the Japan Meteorological Agency and the second Modern-Era Retrospective analysis for Research and Applications (MERRA-2) reanalysis dataset of NASA.

The report highlighted that the Asia-Pacific region is the world's second largest in terms of mineral dust emissions, with four main sand and dust storm corridors: (i) East and North-East Asia; (ii) South and South-West Asia; (iii) Central Asia; and (iv) the Pacific subregions.

The risk assessment report indicated that more than 500m people in India are exposed to medium and high levels of poor air quality due to sand and dust storms, along with 173m people in Pakistan, 62m in the Islamic Republic of Iran and 40m in China. In proportional terms, more than 80 per cent of the entire populations of Turkmenistan, Pakistan, Uzbekistan, Tajikistan and the Islamic Republic of Iran are exposed to medium and high levels of poor air quality due to sand and dust storms.

In the energy sector, sand and dust storms have a considerable impact on the generation of electricity by solar power plants which, measured in economic terms, is greater than USD107m a year in India, and exceeds USD46m and USD37m a year in China and Pakistan. The risk to electricity generation posed by sand and dust storms is likely to become greater as governments strive to ensure access to affordable, reliable, sustainable and modern energy for all (SDG 7).

In the aviation sector, the exposure of aircraft engines to dust particles is a considerable risk on flight paths traversing southwestern and central parts of Asia. Flights to and from airports on the Arabian Peninsula, Pakistan, India, and China are most affected. The risk of a flight delay, diversion and cancellation due to low visibility caused by sand and dust in the atmosphere at ground level is greatest at airports in Central Asia, southern parts of the Islamic Republic of Iran, the border area between Pakistan and India, and northern parts of China.

Large areas of farmland are affected by dust deposition in Turkmenistan (71% of the cropland area), Pakistan (49%) and Uzbekistan (44%). Much of this dust is characterized by a high salt content, which typically makes the dust toxic to plants. This reduces yields, representing a significant threat to the production of irrigated cotton and other crops.

Very high dust deposition occurs in the Himalaya-Hindu Kush Mountain range and the Tibetan Plateau, the so-called Third Pole which provides fresh water to more than 1.3 billion people in Asia. The deposition of dust on glaciers induces a warming effect, increasing the melting of ice, with direct and indirect impacts on society through numerous issues, including food security, energy production, agriculture, water stress and flood regimes.

Cities in southwestern parts of Asia have the highest exposure to sand and dust storms, which make a significant contribution to poor air quality in Karachi, Lahore, and Delhi, where nearly 60 million people experienced more than 170 dusty days a year in 2019. The situation is much worse for 6 million residents of eight cities across the region (three in China, two in the Islamic Republic of Iran, two in Pakistan, and one in Uzbekistan) who breathed air with unhealthy concentrations of particulate matter every day for at least ten months in 2019. The risk of impacts from sand and dust storms is projected to increase in the 2030s due to more extreme drought conditions in parts of Western Australia, south-eastern Turkey, the Islamic Republic of Iran and Afghanistan, while sources in Kazakhstan, northern China, Mongolia and the Ganges basin in India face a lower risk of drought and hence probably less risk from sand and dust storms. The risk in south-eastern Turkey, the Islamic Republic of Iran and Afghanistan is even more likely to materialise given that this area is also projected to experience extremely high levels of water stress in 2030. Managing the risks associated with sand and dust storms may also become necessary in places not previously

recognised as source areas for such phenomena due to more extreme droughts projected in parts of northern and southern Thailand, south-eastern China, northern Malaysia and southeasternmost Australia.

This risk assessment report demonstrated that the cumulative effects of sand and dust storms on society are significant, not least because sand and dust storms are more frequent than most other types of natural hazards. Their impacts are complex, they are very widespread, and they represent an important emerging issue for policymakers. However, our understanding of how sand and dust storms interact with society and the environment is still undermined by considerable uncertainties.

A lack of data presented one of the most prominent challenges throughout the process of conducting this risk assessment. Several types of sand and dust storm hazard are poorly accounted for, and in-depth risk assessments for sand and dust storm events across multiple sectors at national and local levels are needed. At the international level, coordinated multi-country transboundary studies of individual dust storm events are required to fully understand their multiple impacts. The lack of data is particularly acute in the case of economic analysis.

Given the frequent transboundary impact of sand and dust storms, the report findings made a strong case for the design and implementation of well-coordinated actions at national, regional, and interregional levels to combat the socio-economic impact of sand and dust storms.

Operational Objectives and Specific Recommended Actions

To review and facilitate progress towards the realization of the Action Plan, the secretariat, in collaboration with relevant United Nations agencies, should take the following actions:

Operational Objective 1: Improve the understanding of the socio-economic impact of sand and dust storms with a view to accurately inform policies and investments to mitigate their impact and sources.

Recommended actions to reach operational objective 1 through regional cooperation:

1) Develop common guidance and methodologies to conduct impact-based analysis of sand and dust storm events.
2) Conduct impact-based trans-boundary studies identifying the impact of single sand and dust storms events across various countries.
3) Study the effect of dust deposition on different crop types and other forms of food production such as apiculture and pastoralism.
4) Study the effect of dust deposition on key infrastructure including - agricultural infrastructure (e.g., irrigation canals); infrastructure in the energy sector (e.g., transmission lines, forms of electricity generation including wind and solar); information and communication technology.
5) Conduct a comprehensive assessment of the geography of dust sources in the Asia-Pacific region.
6) Prioritize long-term impact study of sand and dust storms on human health, in source and deposition areas.

Recommended actions to reach operational objective 1 at national level

1) Measure the socio-economic impact of sand and dust storms events at national and local level by systematically gathering loss data referred to each event.

2) Report the impact of sand and dust storm events through the Sendai Monitor Framework Monitoring system applying the Guideline on Monitoring and Reporting the Impact of Sand and Dust Storms through the Sendai Framework Monitoring.
3) Put in place systematic surveillance and reporting to monitor the health impact in the short and medium term of sand and dust storms in most exposed and affected areas.

Operational Objective 2. Extend the monitoring system and improvements of the early warning system, with an impact-based focus, to timely forecast sand and dust storms and enable targeted measures to minimise exposure and reduce risks

Recommended actions to reach operational objective 2 through regional cooperation:

1) Increase observation systems of the phenomenon in the region, especially in the South and Southwest Asia region.
2) Produce regular impact-based forecasting at regional level to facilitate transboundary action in the planning, response, and recovery phases of the sand and dust storm disaster risk reduction cycle, including with a view to reduce secondary risks, for example, flood and end-season droughts which might occur if glaciers in the same basin are exposed to sand and dust storms, particularly in the Himalayas-Hindu Kush Mountain range and the Tibetan Plateau.
3) Develop commonly used methodology across the region to conduct impact-based forecasting at national level.
4) Measure the effectiveness of early warning systems in place with a view to provide best practice and state of the art advice at national level.
5) Strengthen connections across existing early warning systems at regional level.
6) Develop common advisory for sector-specific early warning related to sand and dust storms.

Recommended actions to reach operational objective 2 at national level:

1) Strengthen linkages at national level across agencies and services responsible for acting upon forecasting and early warnings about sand and dust storms, including environmental, air pollution, hydrometeorological and meteorological services.
2) Strengthen integration of sand and dust storms early warning systems with those used for other natural hazard response systems at national level.
3) Increase observation points in most affected areas by sand and dust storms and in source areas.

Operational Objective 3. Put in place coordinated regional actions in most at-risk and exposed geographical areas to mitigating risk of and exposure to sand and dust storms.

Recommended actions to reach operational objective 3 through regional cooperation:

4) Develop regular and systematic issuance of forecasting and early warnings related to human health, especially in the South Asia and Southwest Asia region.
5) Study the impact of sand and dust storms specifically on electricity production, including in most remote and off-the-grid areas, in South and Southwest Asia, and East and North-East Asia e Asia Pacific Region.
6) Strengthen the understanding of the impact of dust deposition to the production of irrigated cotton in South and South-West Asia, and North and Central Asia.
7) Jointly assess the impact of sand and dust storms on glaciers and assess the potential impact of secondary disasters, including drought and floods, in South and South-West Asia, East and

North-East Asia, and North and Central Asia where dust might affect water supply in adjacent lowland areas.

8) Establish a network of most-affected cities with high exposure to poor air quality due to sand and dust storms and prioritize impact-based forecasting for these cities with a view to provide early warnings to significantly reduce exposure of urban residents especially in East and North-East Asia, North and Central Asia, and South and South-West Asia cities.

Follow up and review

The implementation of this Action Plan requires a concerted effort amongst member states in the region and various stakeholders at the national and regional levels. The Asia Pacific Centre for the Development of Disaster Information Management of the Economic and Social Commission for Asia and the Pacific, in collaboration with relevant United Nations organizations and the UN Coalition to Combat Sand and Dust Storms, will provide support to member states in regard to the implementation and regular review of this Action Plan.

A Coordinating Group of interested countries will be convened on a yearly basis at a senior political level and on a regular basis at senior expert level to agree on implementation of specific trans-boundary actions as outlined in this Plan of Action; facilitate exchanges of best practices at national and subregional levels; as well as guide the work of the secretariat accordingly.

Time Frame

The plan has an initial duration of five years after which member states are encouraged to review its effectiveness in reaching the desired objective and the related operational objectives and consider renewing the commitment for a further five years thereafter.

References

___ (2016). *Ulaanbaatar Declaration on Preventing Disaster Risk: Protecting Sustainable Development.* Asian Ministerial Conference On Disaster Risk Reduction. Available from: https://www.preventionweb.net/files/56219_ulaanbaatardeclarationfinal.pdf

Asian and Pacific Centre for the Development of Disaster Information Management (APDIM), Economic and Social Commission for Asia and the Pacific (ESCAP) (2018) *Sand and Dust Storms in Asia and the Pacific: Opportunities for Regional Cooperation and Action*. Available from: https://apdim.unescap.org/knowledge-hub/sand-and-dust-storms-asia-and-pacific-opportunities-regional-cooperation-and-action

Asian and Pacific Centre for the Development of Disaster Information Management (APDIM) (2021) *Guideline on Monitoring and Reporting the Impact of Sand and Dust Storms through the Sendai Framework Monitoring*. https://apdim.unescap.org/knowledge-hub/guideline-monitoring-and-reporting-impact-sand-and-dust-storms-through-sendai

Asian and Pacific Centre for the Development of Disaster Information Management (APDIM) (2021) *Sand and Dust Storms Risk Assessment in Asia and the Pacific*. Available from: https://apdim.unescap.org/knowledge-hub/sand-and-dust-storms-risk-assessment-asia-and-pacific

Economic and Social Commission for Asia and the Pacific (ESCAP) (2016) *Resolution 72/7 on regional cooperation to combat sand and dust storms in Asia and the Pacific*, E/ESCAP/RES/72/7. Available from: https://www.unescap.org/sites/default/files/E72_RES7E.pdf

Economic and Social Commission for Asia and the Pacific (ESCAP) (2015) *Resolution 71/12 on Strengthening regional mechanisms for the implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030 in Asia and the Pacific*, E/ESCAP/RES/71/12. Available from: https://undocs.org/E/ESCAP/RES/71/12

Iran UNDP (2017). *Tehran Ministerial Declaration*. Available from: https://www.ir.undp.org/content/iran/en/home/presscenter/articles/2017/07/05/text-of-tehran-ministerial-declaration.html

United Nations (2015). *Sendai Framework for Disaster Risk Reduction 2015-2030.* Available from: https://sdghelpdesk.unescap.org/sites/default/files/2019-12/43291_sendaiframeworkfordrren.pdf

United Nations Convention to Combat Desertification (UNCD)(2017) *Integration of Sustainable Development Goal 15 and related target 15.3 which states: "to combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world", into the implementation of the United Nations Convention to Combat Desertification*, ICCD/COP(13)/2. Conference of the Parties Thirteenth session Ordos, China, 6–16 September. Available from: https://www.unccd.int/sites/default/files/sessions/documents/2017-09/ICCD_COP%2813%29_19_Corr.1-1714882E.pdf

United Nations Environment Assembly of the United Nations Environment Programme (UNEP)(2016). Resolution 2/21 on Sand and dust storms, UNEP/EA.2/Res.21. 23–27 May. Available from: https://wedocs.unep.org/bitstream/handle/20.500.11822/11194/K1607185_UNEPEA2_RES21E.pdf?sequence=1&isAllowed=y

United Nations Environment Programme (UNEP), World Meteorological Organization (WMO), and United Nations Convention to Combat Desertification (UNCCD) (2016). *Global Assessment of Sand and Dust Storms*. Available from: https://uneplive.unep.org/redesign/media/docs/assessments/global_assessment_of_sand_and_dust_storms.pdf

United Nations General Assembly (UNGA)(2015) *Resolution 70/195 on Combating sand and dust storms*, A/RES/70/195. 22 December. Available from: https://undocs.org/en/A/RES/70/195

United Nations General Assembly (UNGA)(2015). *Resolution 69/283 on the Sendai Framework for Disaster Risk Reduction 2015–2030,* A/RES/69/283. 23 June. Available from: https://undocs.org/en/A/RES/69/283

United Nations General Assembly (UNGA)(2015). *Resolution 70/1 on Transforming our world: the 2030 Agenda for Sustainable Development.* A/RES/70/1. Available from: https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_70_1_E.pdf

United Nations General Assembly (UNGA)(2016) *Resolution 71/219 on Combating sand and dust storms*, A/RES/71/219. 21 December. Available from: https://undocs.org/A/RES/71/219

United Nations General Assembly (UNGA)(2019) Resolution 74/226 on Combating sand and dust storms. 19 December. Available from: https://undocs.org/en/A/RES/74/226

United Nations General Assembly (UNGA)(2020). *Combating sand and dust storms: report of the Secretary-General*, A/75/278. 30 July. Available from: https://undocs.org/en/A/75/278

United Nations General Assembly (UNGA)(2020). *Resolution 75/222 on Combating sand and dust storms*, A/RES/75/222. 30 December. Available from: https://undocs.org/en/A/RES/75/222

United Nations General Assembly (UNGA)(2021). *Combating sand and dust storms: report of the Secretary-General*, A/76/219. 23 July. Available from: https://undocs.org/en/A/76/219

World Meteorological Organization (WMO) (2018). *WMO Statement on the State of the Global Climate in 2017 No. 1212*. Available from: https://library.wmo.int/doc_num.php?explnum_id=4453