ESCAP | APDIM Asian and Pacific Centre for the Development of Disaster Information Management

Enhancing Understanding and Expanding Inter-regional and Regional Cooperation on Sand and Dust Storms

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UNITED NATIONS ESCWA | Shared Prosperity Dignified Life

The Socio-economic Impact of Sand and Dust Storms (SDS): Data and Knowledge Gaps,

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Hazards to human populations caused by wind erosion and dust storms

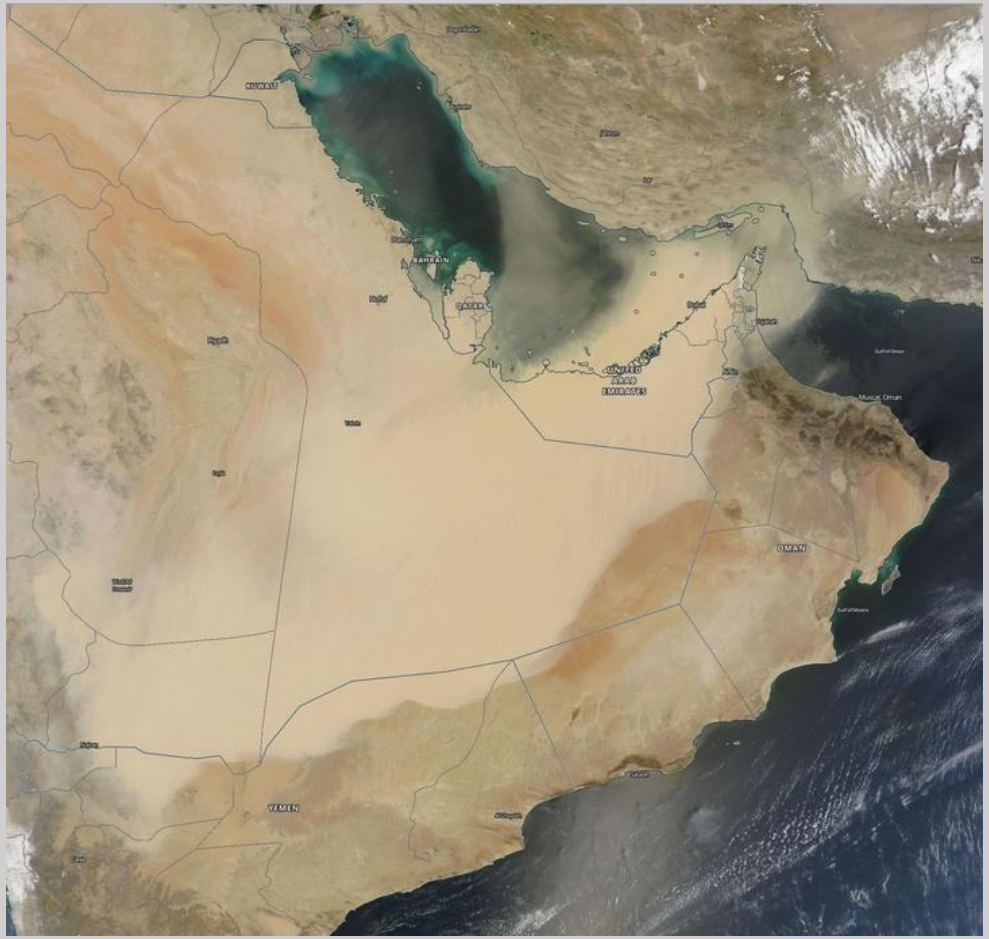
Entrainment	Transport	Deposition
Soil loss	Sand-blasting of crops	Salt deposition and groundwater salinization
Nutrients, seeds, fertilizers, beneficial microorganisms loss	ICT problems	Reduction of reservoir storage capacity
Crop root exposure	Microwave attenuation	Drinking-water contamination
Undermining structures	Transport disruption	Ice melt due to dust radiative forcing
	Local weather and climatic effects	Crop damage and growth problems
	Air pollution	Burial of structures
	Respiratory problems and eye infections	Machinery problems
	Disease transmission (human)	Reduction of solar power potential
	Disease transmission (plants & animals)	Power supply disruption (electrical insulator failure)

Source: Middleton (2017). Note: acute, short-term issues and chronic, long-term issues

1-3 April 2015
Dust alert: 14 countries affected over 10 m sq km

Health: emergency department incident response activated at Hamad General Hospital, Doha. Health warnings issued & PM10 national standards exceeded in Saudi Arabia, Qatar, UAE, Iran, India

Education: schools closed in Saudi Arabia, Qatar



Construction: workers told to stop work in UAE

Aviation: Flight delays, diversions and cancellations in Saudi Arabia, Bahrain, Qatar, UAE, Oman, Yemen, Iran

Maritime transport: ports closed in Iran, Saudi Arabia

Road transport: spike in road traffic accidents in Saudi Arabia, Qatar, UAE

Riyadh, Saudi Arabia

Doha, Qatar

14-15 March 2021
Major dust storm in Mongolia/China

Houses in Dundgovi province before the wind. ***(Photo: Mongolia Red Cross)***

Livestock killed by the storm in Dundgovi province. ***(Photo: Dundgovi Red Cross)***

Ger is destroyed in Uvs province. ***(Photo: Mongolia Red Cross)***

Killed 8 people + about 200,000 livestock
Destroyed 121 animal shelters
Damage to major infrastructure (electricity pylons and sub-stations)
Hundreds of flights cancelled at Beijing airport
16 March dust health advisory for 10 cities and counties in South Korea

Air quality and health

- Many epidemiological studies show associations of dust exposure with increase in mortality and hospital visits and admissions due to cardiovascular and respiratory diseases
- Evidence still inconsistent in different geographical areas
- Physical, chemical and biological effects
- Long-term (chronic) health impacts much less well known
- Most health impact studies examine effects far from SDS sources, NOT in dryland areas

SDS and agriculture

- Impacts in both SDS source areas and deposition areas
- Need detailed information at high spatial resolution on SDS source area locations
- Soil erosion leads to productivity decline but few quantitative or economic studies of impacts
- Dust deposition may smother plants, saline dust may be toxic, but inputs can also provide nutrients but few quantitative studies of these impacts
- Relationship between SDS and land degradation is complex, multi-faceted and synergistic
- SDS rapidly reduces soil organic carbon stocks (links to climate change and Land Degradation Neutrality or LDN)

SDS: economic cost of impacts

Few attempts to assess economic costs: Most estimate market costs only

Economic cost estimates of individual events

Item	Location	Cost (US$)	Reference
On- and off-site costs Red Dawn* SDS 23 Sep 2009	New South Wales, Australia	US$219m	Tozer & Leys (2013)

*Red Dawn major costs: household cleaning, commercial activities (retail and service industries), air transport and construction

Cost estimates of SDS hazards to specific sectors

Item	Location	Cost (US$)	Reference
Crude oil - loss of exports	Kuwait	>US$1m per ship (2014: 8 dust storms); US$3.5m per ship (2008: 22 dust storms)	Al-Hemoud et al. (2017)
Aviation - flights cancelled	Canary Islands	US$21m (22-24 February 2020 SDS event: 1000 flights cancelled)	Suárez et al. (2021)

Annual cost estimates of SDS hazards

Few attempts to assess economic costs: no consistent methods used for data collection or analysis

Item	Location	Cost (US$)	Reference
Total costs	South Korea	5.6bn	Jeong (2008)
Total costs	Iran	1.0bn	Meibodi et al. (2015)
Total costs	Iraq	1.4bn	Meibodi et al. (2015)
Off-site	USA	9.6bn	Pimentel et al. (1995)
Off-site	Sistan Region, Iran	25m	Miri et al. (2009)
Off-site	South Australia	17m	Williams & Young (1999)
Total costs	Beijing, China	265m	Ai and Polenske (2008)

SDS and other sectors – few studies, little known

- Transport: roads and rail lines (often very localised)
- Glacier melt and water supply (direct and indirect impacts on society via e.g. food security, energy production, agriculture, water stress, flood regimes)
- Information and communications technology (ICT)
- Water quality (surface water and groundwater)
- Electricity generation sub-sectors (inc. transmission grids, wind power)

Conclusions

- **SDS pose serious hazards in drylands and beyond drylands (due to long-distance transport)**
- **Realisation of importance of SDS hazards is raising policy profile**
- **But** research **into the hazard and DRM implications of SDS lags behind**
- **Lack of data is one of the most prominent challenges**
- **Lack of understanding and literature on some impacts also considerable challenge**
- **Standardised methodologies for data collection and analysis needed**
- **Economic impact assessments needed – SDS post damage assessment (SDS-Sendai FM)**
- **Case studies of impacts in multiple countries needed for this transboundary hazard**

Thanks for listening