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Minghui Lyu

PRELIMINARY EVALUATION OF THE BENEFIT OF DISASTER PREVENTION FROM RAINSTORMS USING THE INTEGRATED DISASTER RISK GOVERNANC MODEL

Minghui LYU

Public Meteorological Service Centre, CMA, CHINA

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Contents

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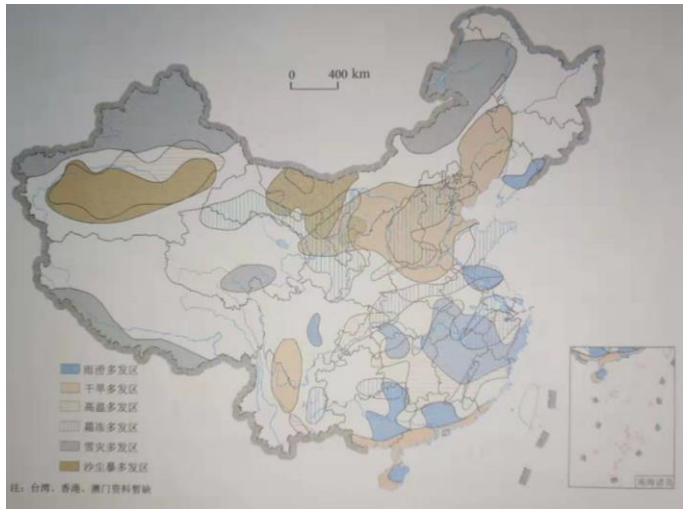
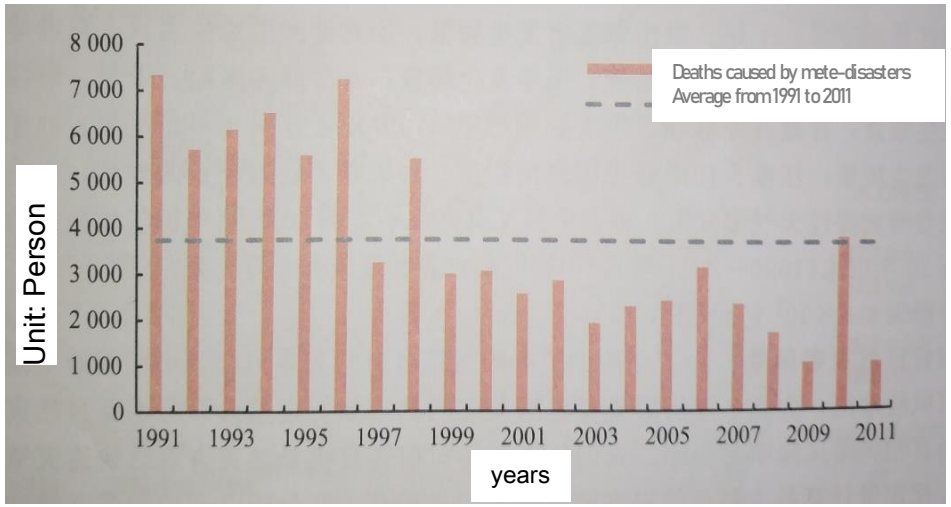
1. Introduction

- Rainstorms are one of the most common meteorological disasters in China especially during the rainy season. According to the statistics, from January to September 2020 there were 45 heavy precipitation weather events, with an area precipitation of 622 mm, causing 21 floods in major rivers.



Distribution Map of Meteorological Disasters in China.
(Note: Lack Information of Taiwan, Hong Kong, Macau)
(Shi, 2016)



Changes in Death Tolls Caused by Meteorological Disasters in China
(Shi, 2016)

2. Research Framework

- The evaluation of the benefits of rainstorm disaster prevention and mitigation focused on an assessment of rainstorm meteorological services and of the effectiveness of rainstorm defence behaviour.
- Based on the Government-led, Sectoral Linkage and Public Participation disaster prevention system locally.
- Establish evaluation index system and calculation formula on the selected indicators and parameters.

Based on Social Investigation

- Combined with the current general evaluation technology and sociological research methods.
- A primarily description and statistic to proposes a social-economic benefit assessment method.

2.1 Evaluation of Rainstorm Meteorological Services

Key Indicator	First-level Metrics	Second-level Metrics
Comprehensive Evaluation of Rainstorm Meteorological Service	Rainstorm forecast and early warning indicators	Accuracy evaluation of Forecast
		Timeliness evaluation of early warning released
	Public Weather Service Indicators	Channel diversity and early warning coverage of forecast and early warning distribution
		Rainstorm Defence Proposal Release
	Decision-making Meteorological service indicators	Timeliness of decision-making meteorological services
		Response, feedback and measures of the local government
	Specialized Meteorological Services indicators	Timeliness of specialized meteorological services
		Response, feedback and measures from industry
	Social feedback indicators	Public feedback
		Media feedback

2.2 Rainstorm Defence Behaviour Evaluation

Key Indicator	First-level Metrics	Second-level Metrics
Rainstorm Defence Behaviour Evaluation	Government Guiding	Rainstorm defence organization system
		Rainstorm defence emergency management
		Ability of personnel transfer and sheltered
		Water conservancy, emergency shelters and other construction projects evaluation
	Departmental Interaction	Emergency treatment
		Emergency support
	Public Participation	Defence capability

2.3 Calculation of Benefit Value of Disaster Prevention and Reduction for Rainstorm Meteorological Services

(1) Calculation Formula of Number of Casualties Reduced

$$R_m = A_m \times C_{Rm}$$

(2) Calculation Formula of Public Savings in Economic Losses

$$P_b = T \times \frac{1}{n} \sum_{i=1}^{n} A_p$$

(3) Calculation Formula of Comprehensive Benefit Value of Disaster Prevention and Mitigation

$$B = \frac{AMG(1-S)}{1-MG(1-S)}$$

- In 2018, investigations were carried out by the Public Weather Service Centre,CMA, in association with an independent survey company. This research surveyed 3618 members of the public and 587 government and linkage staff, giving a total of 4025 valid samples.

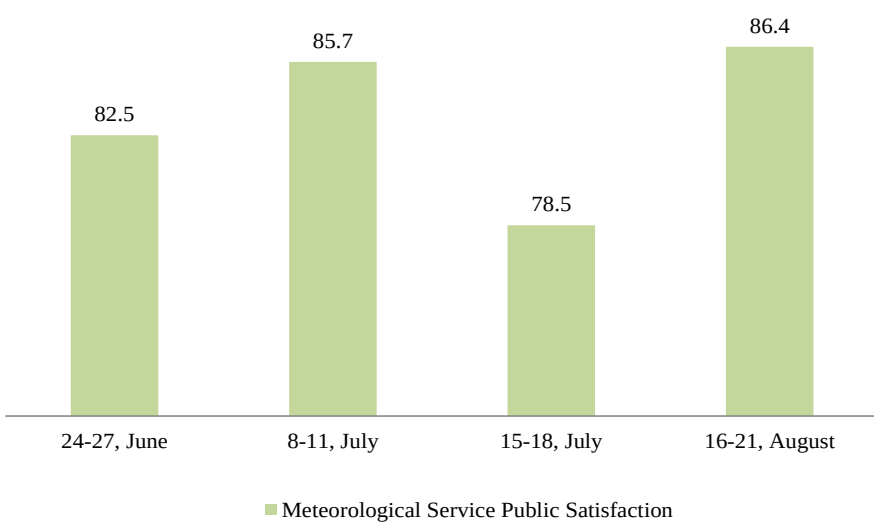
Time	24-27, June	8-11, July	15–18, July	16–21, August	Total
Provinces	Anhui, Henan, Jiangsu, Shandong, Sichuan	Gansu, Shaanxi, Sichuan	Beijing	Anhui, Henan, Jiangsu, Liaoning, Shandong	14
Number of Public samples	1519	757	561	781	3618
Number of Government and stakeholders	171	167	52	197	587

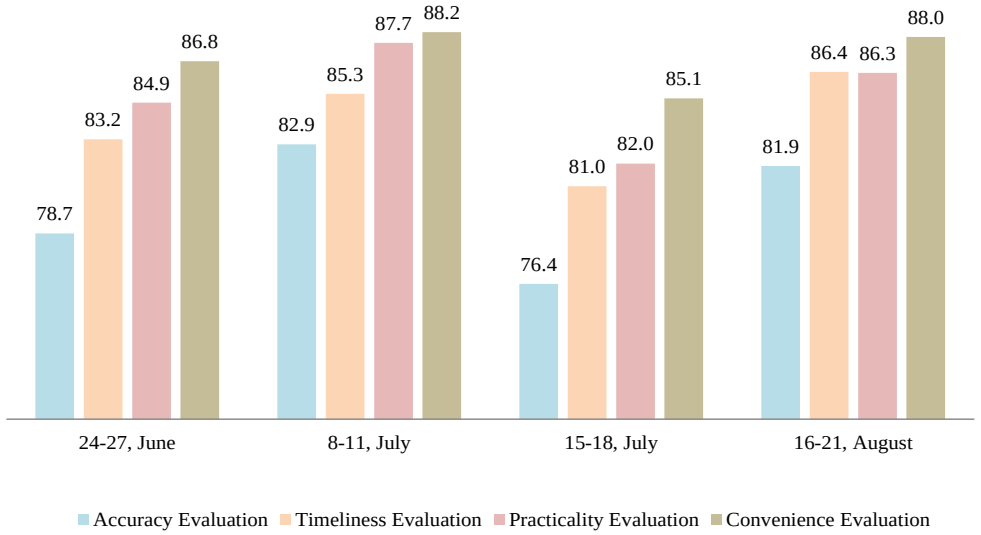
3. Results and Discussion

3.1 Statistical Data of Damage and Losses from Rainstorms

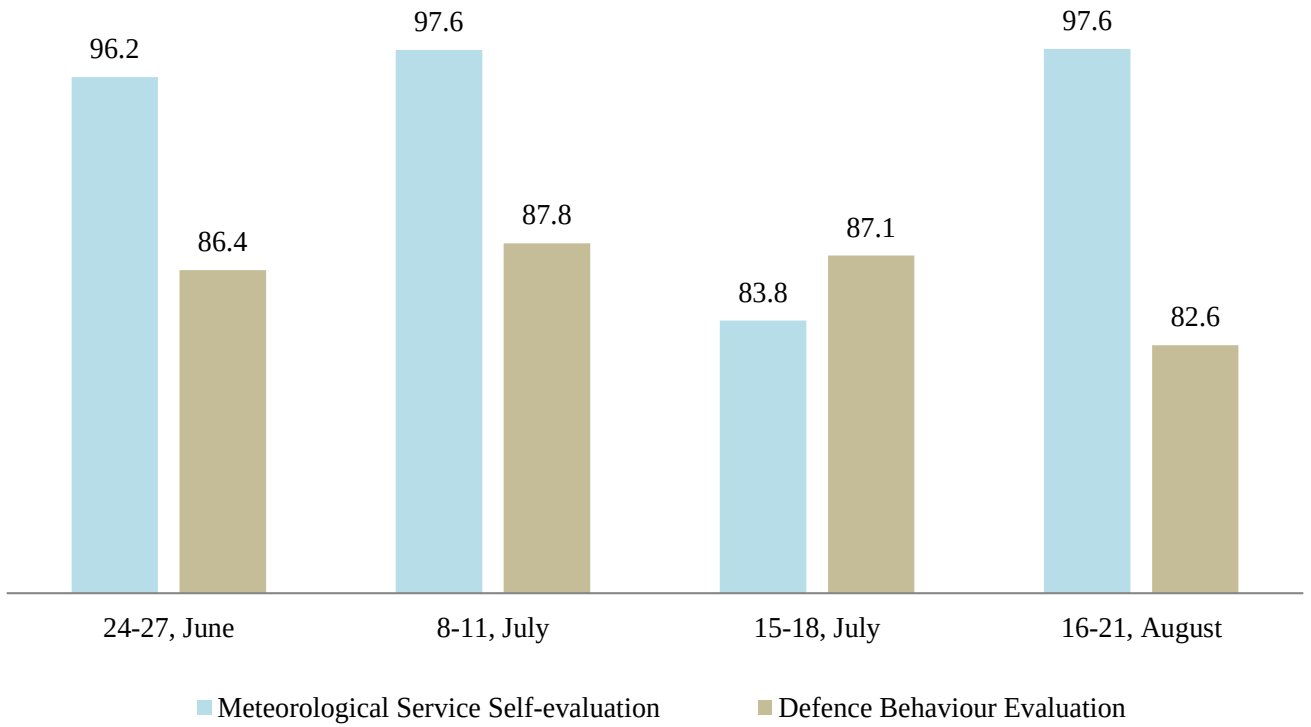
- The social and economic costs of four major rainstorms in 2018 is compiled by MEM.

3.2 Public Evaluation of Rainstorm Meteorological Services





3.3 Rainstorm Meteorological Service Self-evaluation Results and Rainstorm Defence Behaviour Evaluation



3.4 Comprehensive Benefit Value of Disaster Prevention and Mitigation

	24-27, June	8-11, July	15–18, July	16–21, August
Average saving losses of public (yuan / person)	402.6	873.9	369.7	795.7
Public saving losses (1 Billion yuan)	0.209	3.26	0.059	12.33
Comprehensive benefit value of disaster prevention and mitigation (1 Billion yuan)	5.89	33.1	0.278	61.58

4. Conclusions

- The rainstorm meteorological service evaluation of the effectiveness of disaster prevention and mitigation is operational, but there are still many specific details that need to be adjusted and improved.
- Further study should be carried out to investigate the relationships between some of the findings here. Parts of the self-assessment data and early warning information release data need to be standardized and unified to improve their usability.
- Finally, the comparability of the evaluation results needs further verification and testing. Understanding how to verify the science and rationale behind the benefit values should also be an important topic in future research.

Thank you!