Study on benefit evaluation of typhoon Nesat and Haitang disaster prevention and mitigation in 2017

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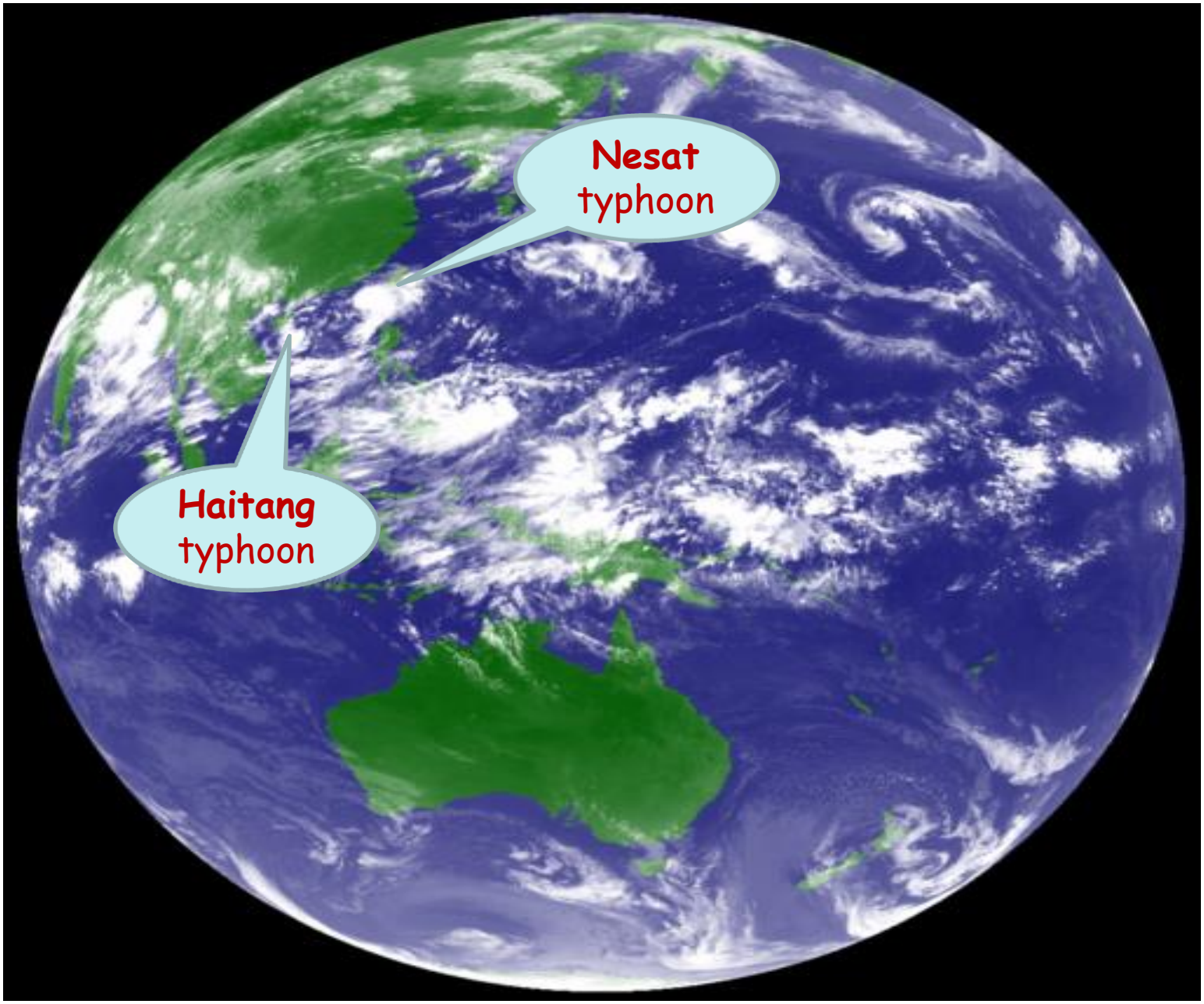

Fig.1 The satellite cloud chart of Nesat and Haitang typhoon

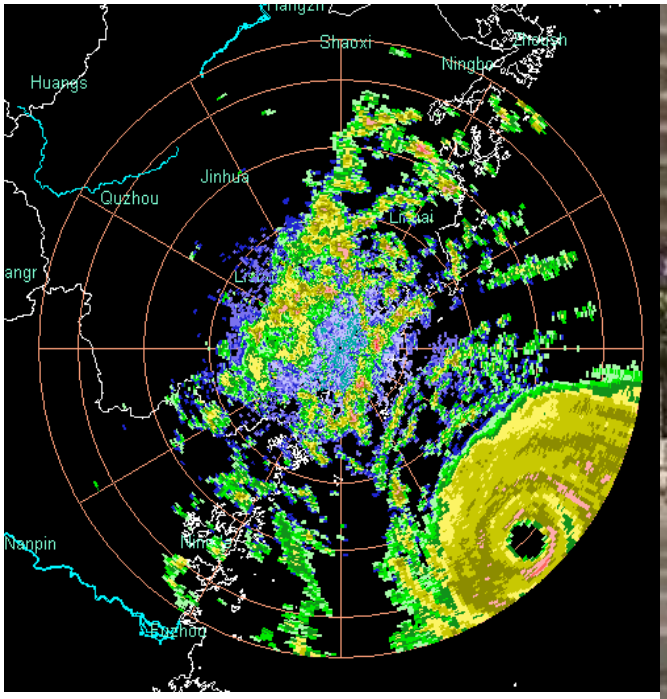

Fig.2 Typhoon Nesat and Haitang 21 hours apart have landed in the Fuqing coastal area of Fujian Province, a record for the first time since 24 hours has landed in the same county historical records.

Tab.1 Disaster situation of similar typhoon Fung Wong and Matmo during 2000-2016

1.422-0.827＝0.595 billion yuan

Typhoon number	Typhoon Name	Typhoon Grade	Landing site	Landing time	Economics Loss (billion yuan)	Land pressure (hpa)	Landing wind speed (m/s)
0808	Fung Wong	Typhoon	Fuqing	07.28 22:00	1.422	975	33
1410	Matmo	Violent typhoon	Fuqing	07.23 15:30	1.265	980	30
1709	Nesat	Typhoon	Fuqing	07.30 06:00	⋮	975	33
1710	Haitang	tropical storm	Fuqing	07.31 02:50	0.827	990	18

0. 827 billion yuan

- According to the characteristics of typhoon Nesat and Haitang double the average method of anomaly estimation method by similarity analysis, prediction of typhoon Nesat and Haitang double typhoon will caused direct economic losses of 0.8～1.8 billion yuan,
- which was calculated as follows: first find 2 historical phase like direct economic losses the average value of approximately 1.3 billion yuan, after taking a positive and negative anomaly of 0.5 billion yuan.
- Reduce economic losses 0.595 billion yuan,

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1. Typhoon situation of Nesat and Haitang
2. Risk assessment of typhoon disaster
3. Study on benefit assessment of typhoon disaster prevention and reduction
4. Conclusion and discussion

Nesat and Haitang double typhoon disaster risk assessment mainly consider 4 factors, established the following typhoon disaster risk index assessment model:

$$DRI = (H^{W_H})(E^{W_E})(V^{W_V})[0.1(1-a)R + a]$$

$$H=W_H X_H \quad E=W_E X_E \quad V=W_V X_V \quad R=W_R X_R$$

DRI is the typhoon disaster risk index. H, E, V and R denote disaster risk factors, disaster environment sensitivity, disaster bearing body vulnerability and disaster prevention and mitigation capacity factor index respectively.

Basically consistent

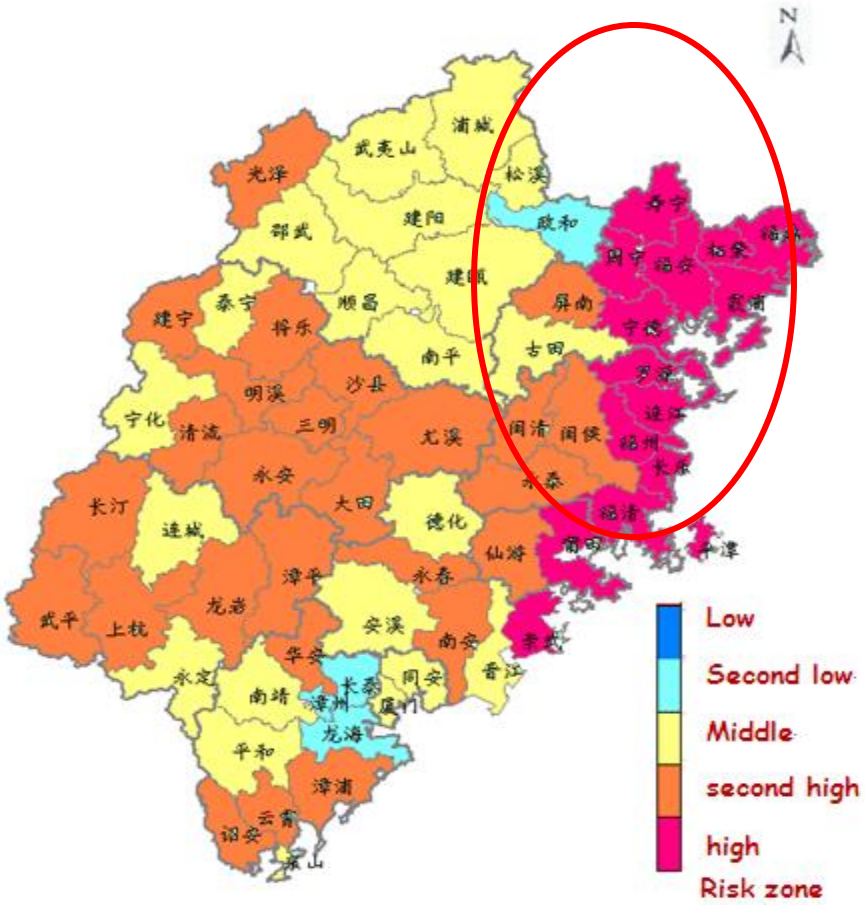

Fig.3 The distribution of Nesat and Haitang typhoon disaster risk evaluation

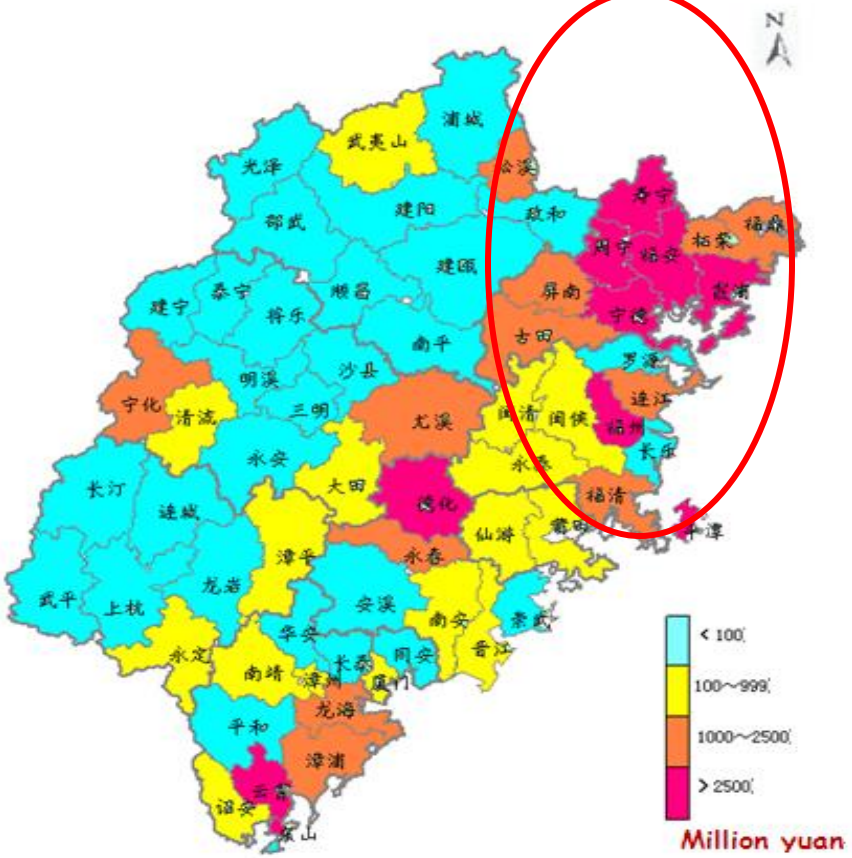

Fig.4 The distribution of Nesat and Haitang typhoon actual disaster

Comparison of Typhoon Nesat and Haitang the actual situation (Fig.4) can be seen:

The result of pre evaluation and the actual situation is basically consistent with the actual situation, the distribution range of typhoon disaster in high risk areas, high-risk areas and heavy disaster area are mainly concentrated in the landing point at the top right of the region, the typhoon disaster risk inland areas exist overvalued, and that after the typhoon moving path and the peripheral distribution of precipitation cloud.

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Design of the questionnaire:

- Three kinds of questionnaires are designed to invest the behavior benefit of typhoon prevention which are for the government, department and community respectively
- The survey form include field survey and telephone survey
- Key point:

-- What measures will be taken by the Government ,departments, NGOs and public in order to response to Nesat and Haitang typhoon?

Benefit Evaluation Index

The first level index	The second level index	The third level index
Benefit of the governmental behavior A	The typhoon defense organization system A1	Policy, legislation and regulations of anti-typhoon construction A1.1
		Disaster prevention and reduction organization A1.2
		Defense command system A1.3
	The typhoon defense emergency management A2	Launched the emergency plan A2.1
		Emergency information distribution A2.2
		Disaster prevention publicity A2.3
	Transfer of personnel and ships back to harbor A3	The transfer number A3.1
		Quantity of ships back to harbor A3.2
	Engineering construction A4	Construction of water conservancy facilities A4.1
		Safe harbor construction A4.2
		Emergency shelter construction A4.3

Benefit Evaluation Index

The first level index	The second level index	The third level index
Benefit of the department behavior B	The typhoon disaster early warning B1	forecasting accuracy B1.1
		timeliness of forecasting and warming B1.2
		forecast warning coverage B1.3
	Emergency disposal B2	departments joint consultation B2.1
		shutdown factory, stop production, suspend class B2.2
		the property protection measures B2.3
		Emergency rescue B2.4
		disaster investigation, collection, evaluation B2.5
	Emergency safeguard B3	Disaster relief supplies B3.1
		Emergency service guarantee (medical, security, rescue) B3.2
		Technical support (communication, transportation, water supply, power supply) B3.3

Benefit Evaluation Index

The first level index	The second level index	The third level index
Benefit of the community behavior C	Defensive quality C	Knowledge about typhoon disaster C1.1
		flight and self-help ability C1.2
		Participation C1.3

Survey Field Scene

Result of Field Survey

According to the field investigation and telephone survey, we can get the following conclusions:

- The benefit of Nesat and Haitang Typhoon prevention and preparedness behavior in Fujian Province for economic is 75%, which means reduce the direct economic loss owing to ships back to harbor, construction of geological disaster prevention system, and reinforcement of the culture cage, et al.

Result of Field Survey

- The benefit of Nesat and Haitang Typhoon prevention and preparedness behavior for people's lives is 86%, which means reduce the death owing to the fishermen come ashore and the staff relocated to the emergency shelter.

- The meteorological service satisfaction for Nesat and Haitang Typhoon is 91 (full mark is 100) according to the questionnaires.

Result of telephone Survey

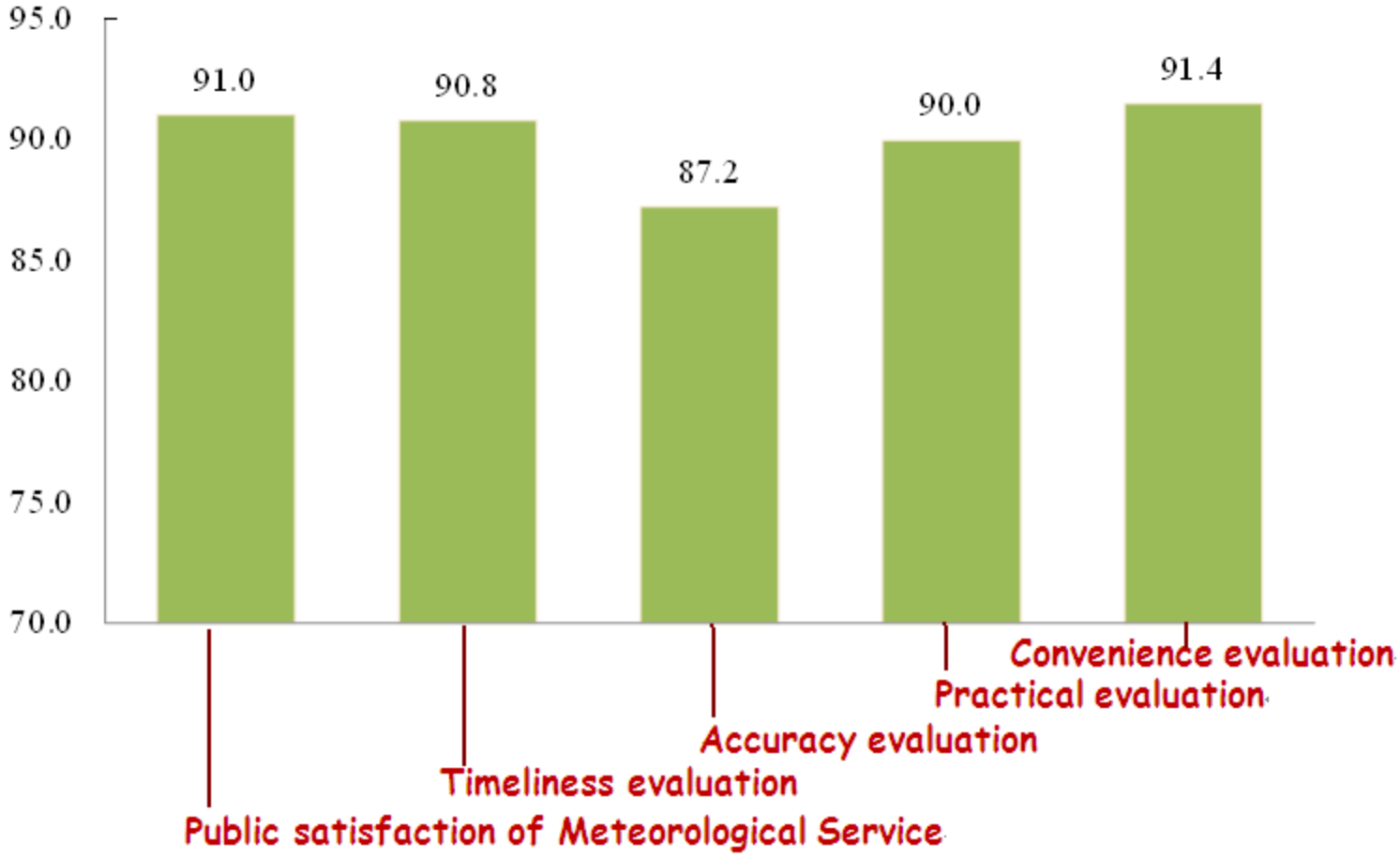

Fig.5 Nesat and Haitang Typhoon public meteorological service satisfaction distribution chart

Result of telephone Survey

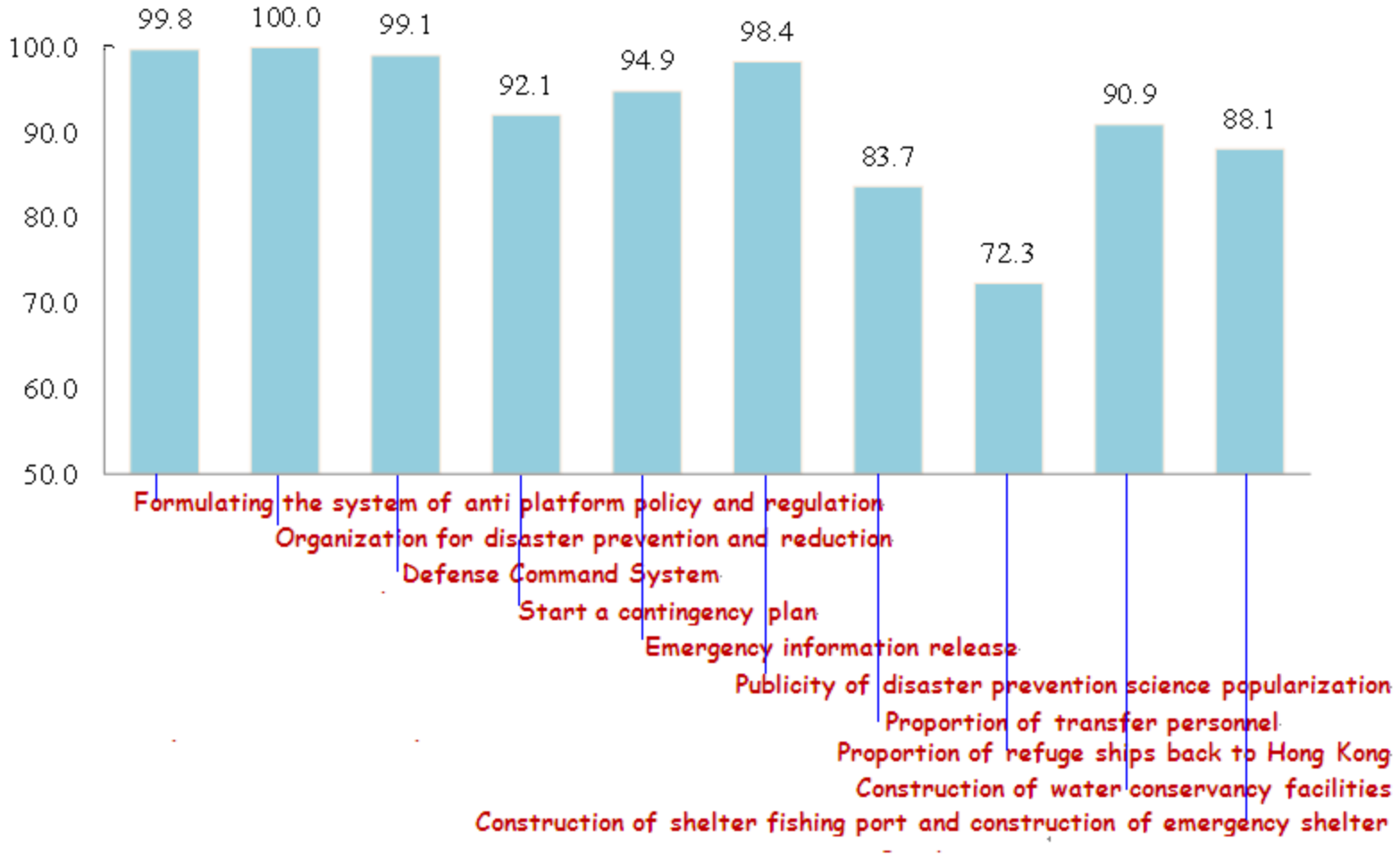

Fig.6 The government department of defense Nesat and Haitang typhoon leading role evaluation chart

Result of telephone Survey

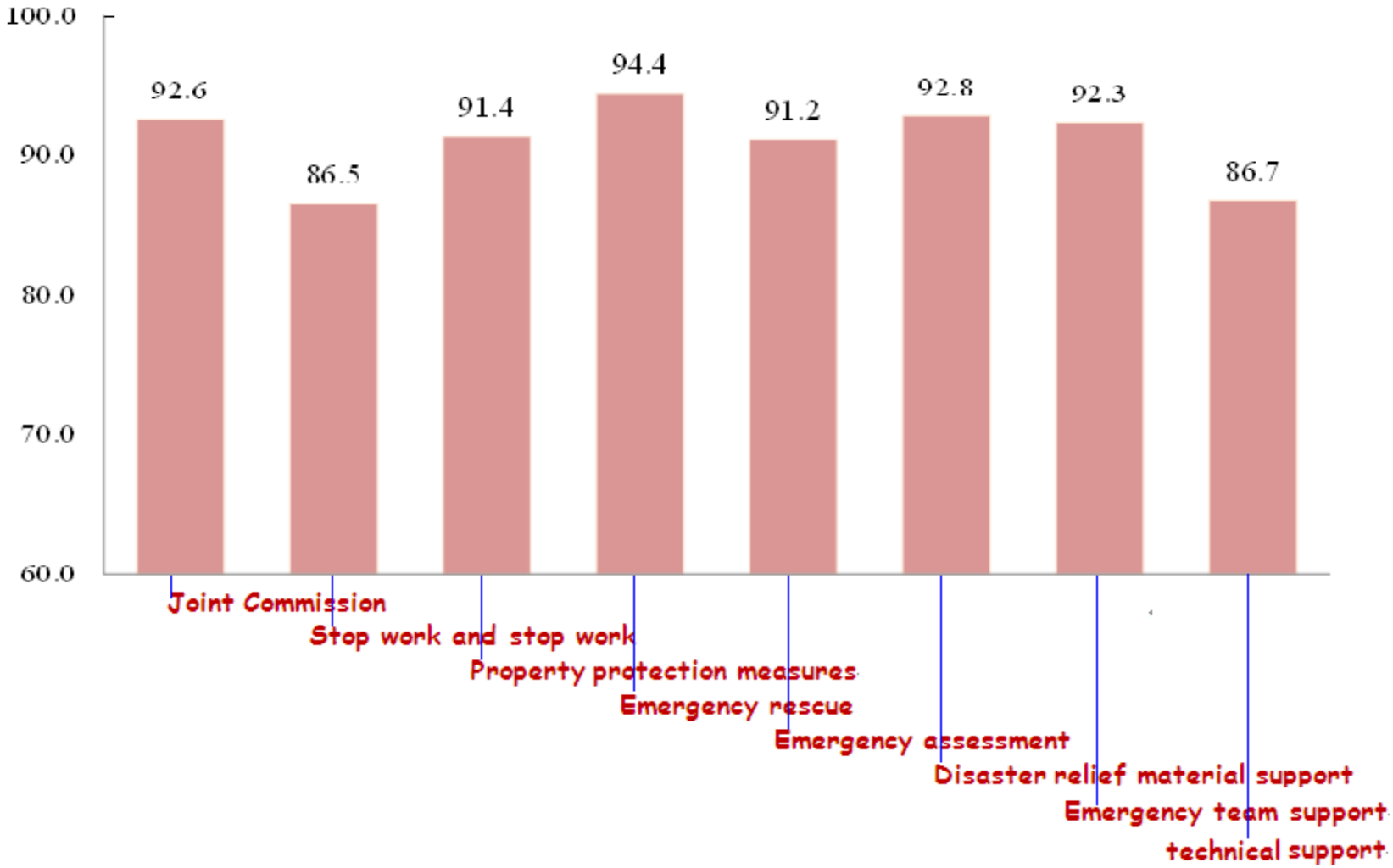

Fig.7 Department of defense linkage Nesat and Haitang typhoon participation in the evaluation chart

Result of telephone Survey

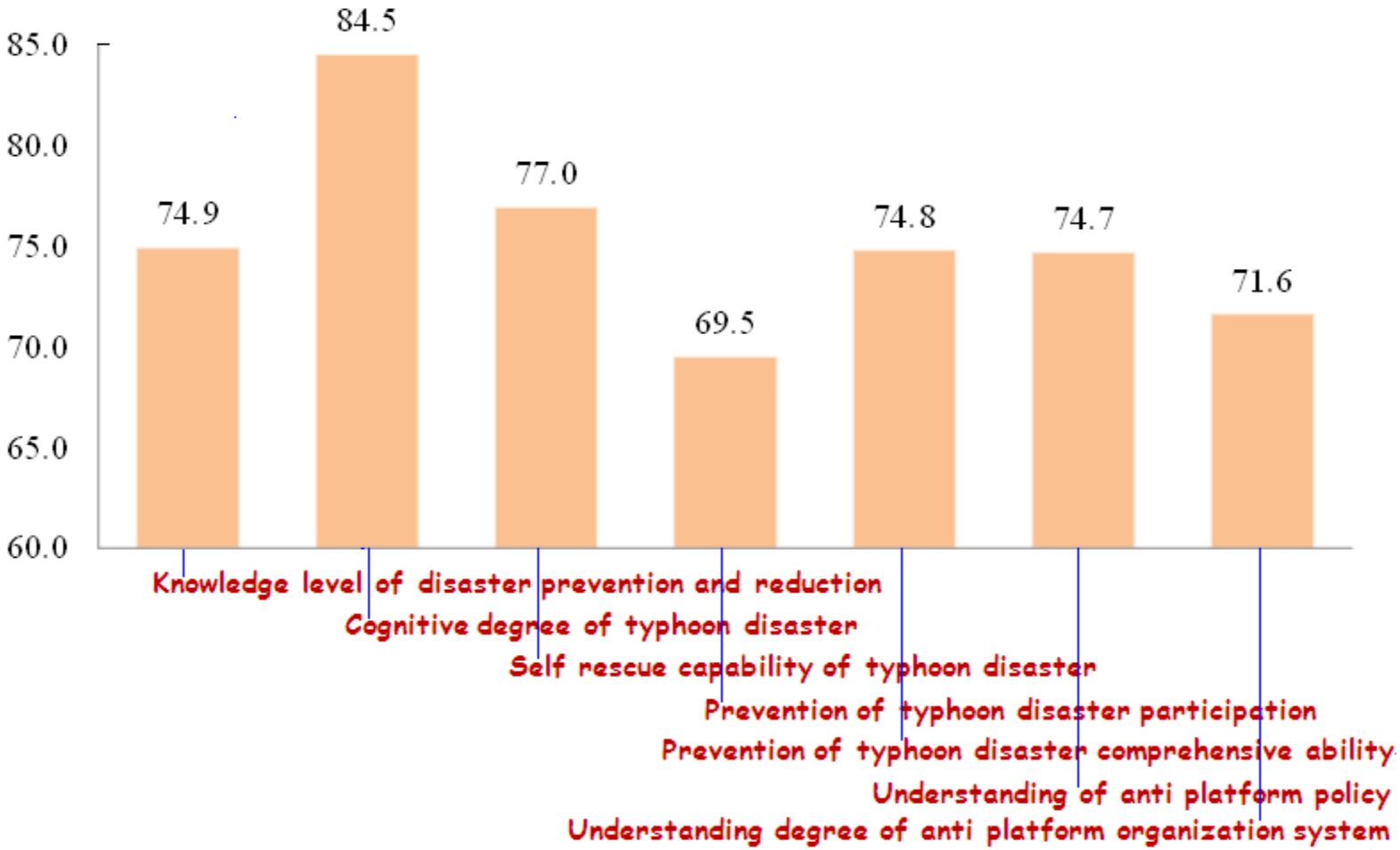

Fig.8 Evaluation of the public figure defense Nesat and Haitang typhoon comprehensive ability chart

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- The According to the Fujian Provincial Department of Civil Affairs disaster statistics, typhoon Nesat and Haitang caused a direct economic loss of 827 million yuan, in the prediction of the lower limit of the range, the estimate is consistent with the actual situation and minimize disaster losses.
- The result of pre evaluation and the actual situation is basically consistent with the actual distribution of typhoon disaster disaster, The practice has proved that the risk assessment of typhoon disaster has a good decision guiding role to determine the defense key areas of the disaster prevention work.
- The according to the 2017 typhoon Nesat and Haitang the third party evaluation survey, the index at all levels can better reflect the actual benefit and the effect and evaluation of Fujian province typhoon disaster prevention and mitigation .

Thanks!

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