Decentralization and Deconcentration, Aid, Natural Disasters : Impact on Poverty Reduction in Cambodia 2007-2009

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[1]*The views expressed are those of the authors and do not necessarily reflect official views of the NCDD Secretariat nor the Department of Navy/Department of Defense/U.S. Government.*

Contents

Objectives

- To test the hypothesis that natural disasters, D&D, and Aid allocation to sub-national level (province) have an impact on poverty
- To quantitatively estimate the magnitude of the effect of D&D and Aid allocation by donors on sub-national level poverty
- To estimate the total annual economic loss from natural disasters.

Data and Methodology (1)

- Three data sources at provincial level during 2007-2009 were utilized for this study.
- The dependent variable is annual poverty rate at the provincial level (NCDD and MoP 2010)
- The independent variables are the fund allocation through the annual work plan and budget of the National Committee for Sub-National Democratic Development (NCDD, 2007-2009) and the funds allocated by donors during 2007-2009 from the Aid effectiveness report 2010 (CRDB, 2010). Natural disasters and other independent variables were used as controls in the model and were sourced from the Commune Database (MoP, 2010)

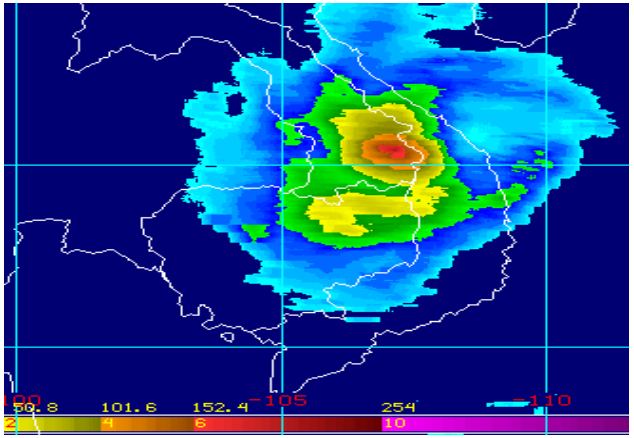
Data and Methodology (2)

- To test the hypothesis of the impact of natural disasters, D&D, and Aid on poverty, we use statistical significant hypothesis theory employing the robust panel principle component regression model.
- To find the magnitude size of the impact of D&D and Aid, and the economic value of annual loss from natural disasters, standardized (beta) regression coefficient of D&D, Aid, and natural disasters were used.

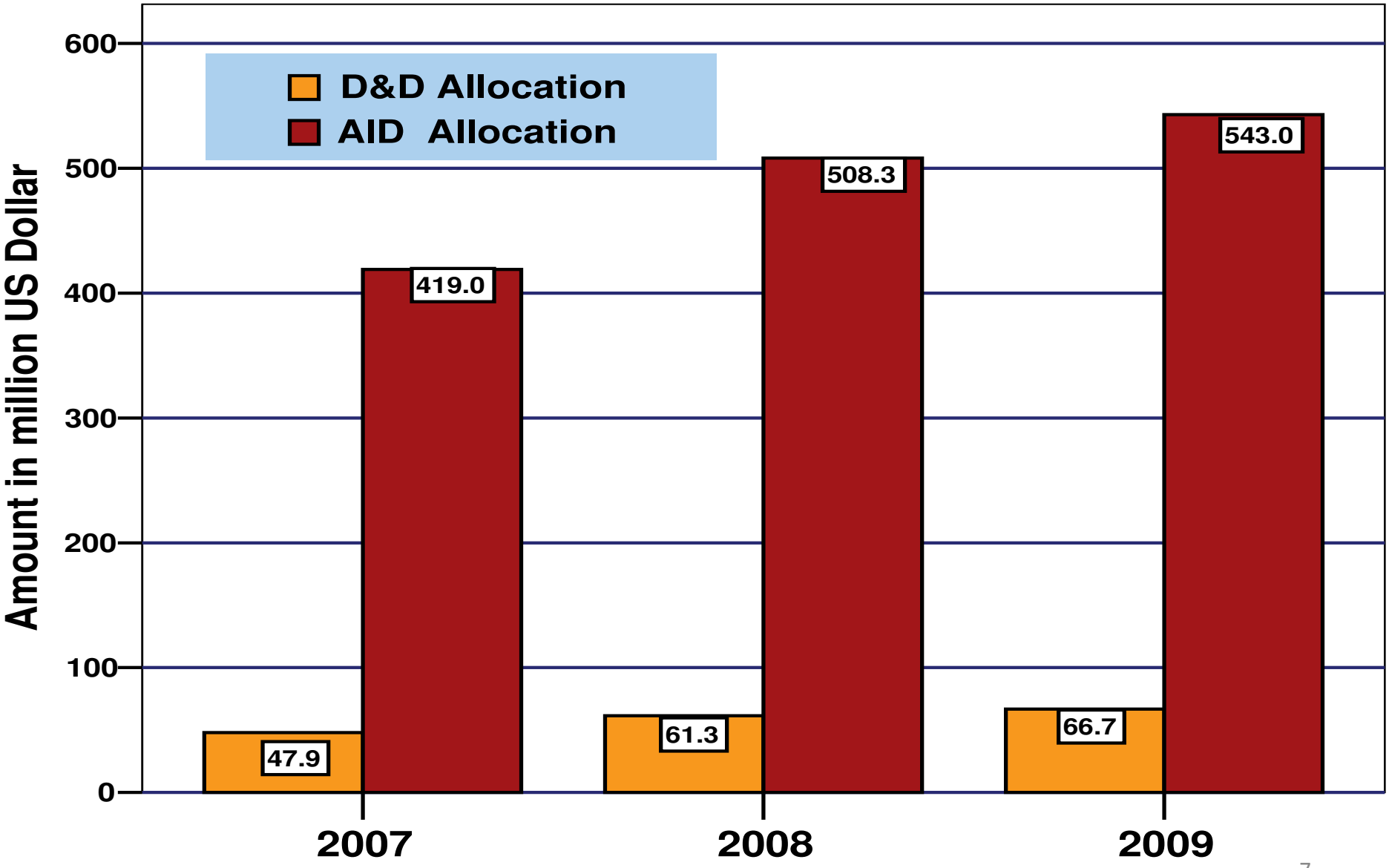
Descriptive Statistics

- Table 1: Average during 2007-2009 (provincial level)

Variables	N	Min	Max	Mean	Std. Deviation
Poverty rate (%)*	72	0.100	44.500	29.726	9.543
Household affected by natural disaster (%)	72	0.000	23.300	4.163	3.762
Total amount D&D allocation in US$ million	72	0.308	7.157	2.444	1.554
Total amount of Aid allocation in US$ million	72	1.322	77.928	20.422	17.965

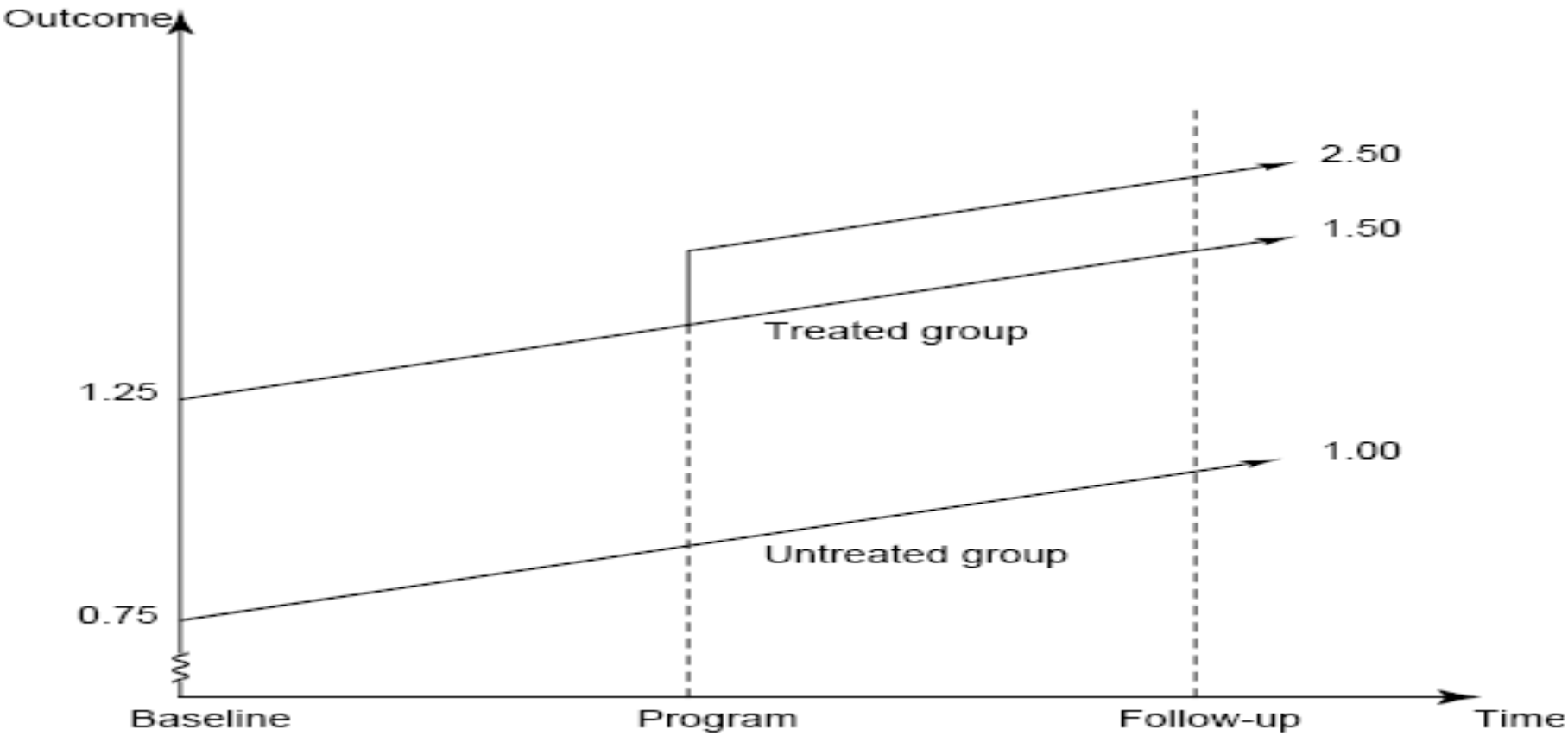


Total amount of D&D and Aid allocation at (provincial level)



Overview of Methodology (1)

To find the net impact, the technique of difference-in-differences method is used which requires a baseline, follow-up observation, treatment and control group in figure below:



Overview of Methodology (2)

- Generally we can write the difference-in-differences methods into linear model (OLS). With baseline and follow–up observation, we can write the linear model as:
- $y_i = \alpha + ß_1 T + ß_2 D\&D + ß_3 AID + ß_4 NAT + ß_5 (T*D\&D) + ß_6 (T*AID) + ß_7 (T*NAT) + ß_8 X_i + \varepsilon_i \quad i = 1,\ldots,n \quad (1)$
- Where y_i is the outcome of interest, *T* is a dummy variable for time period (trend). X_i represents provincial characteristics.
- The coefficients of interest $ß_5$ $ß_6$ $ß_7$ multiply the interaction term (T*D&D), (T*AID) and (T*NAT) which are the variable of interest.

Robust Panel Principle Component Regression

- With yearly panel data available we can write equation (2) which equivalence to (1) by Panel OLS equation:

$$y_{it} = (\alpha + u_i) + ß_1 T + ß_2 D\&D + ß_3 AID + ß_4 NAT + ß_5 X_{it} + v_{it}$$

$$i = 1,\ldots,n \quad t = 1,\ldots,T \quad (2)$$

- Where u_i is the dummy variable for each province and T is the dummy variable for time.
- Equation (2) can be estimated by
  - Fixed effect or Random effect, we favor Fixed effect based on AIC, BIC and Hausman test applying LSDV with combination of Robust Principle component regression

Empirical Results

- *Table 2: Determinants of poverty (%)*

No	Independent Variables	Model 1-CPCR-9: Fixed effect				Model 2-RPCR-10: Fixed effect			
		Reg Coef	Std Error	Beta Coef	VIF	Reg Coef	Std Error	Beta Coef	VIF
0	Intercept	77.860				90.518			
1	Log total amount D&D allocation (US$)	-0.379	0.125	-0.029	0.7	-0.118	0.042	-0.010	0.2
2	Log total amount Aid allocation (US$)	-0.341	0.075	-0.032	0.4	-0.347	0.041	-0.039	0.3
3	Household affected by natural disaster (%)	0.093	0.042	0.036	2.1	0.059	0.033	0.024	2.3
4	Landless family (%)	0.557	0.056	0.178	2.5	0.346	0.010	0.130	0.2
5	Farmer household (%)	0.072	0.002	0.152	0.2	0.055	0.002	0.117	0.2
6	Dependency ratio (%)	0.381	0.023	0.125	0.4	0.418	0.012	0.131	0.2
7	Log population	-0.162	0.057	-0.019	0.3	-0.339	0.024	-0.045	0.1
8	Literacy rate 18-60 years (%)	-0.100	0.005	-0.122	0.3	-0.101	0.004	-0.116	0.2
9	Log per capita consumption/day (Riel)	-6.268	0.141	-0.269	0.3	-7.873	0.108	-0.311	0.2
10	Atkinson index of inequality (0-1)	6.105	1.000	0.056	0.6	7.394	0.302	0.083	0.1
Province fixed effect (24 minus 1 dummy province)		YES				YES			
Number of repeated observations		72				72			
R-square		0.99528				0.99712			

Note: *Time and Provincial dummy regression coefficients are not report here, Model 1-CPCR-9 is Classical principle component regression with nine components omitted. Model: 2-RPCR is Robust principle components regression with ten components omitted adjusted co-linearity, non-normality, outlier and leverage observations, measurement error for both y and x spaces and heteroskedasticity using Robust EM algorithm applying weight Huber estimation method.*

Cost Effectiveness Through D&D and Aid Channels

- One standard deviation increase in D&D investment (US$1,554,000) will reduce poverty by -0.010 standard deviation or equal -0.100%.
- One standard deviation increase in Aid allocation (US$17,965,000) will reduce the poverty rate by -0.039 standard deviation or -0.370 %.
- Therefore, the effectiveness of poverty reduction between D&D and Aid has a ratio of 2.6:1. The average million US$ of poverty reduction is -0.064% for D&D and -0.025% for Aid.

Cost of Natural Disasters

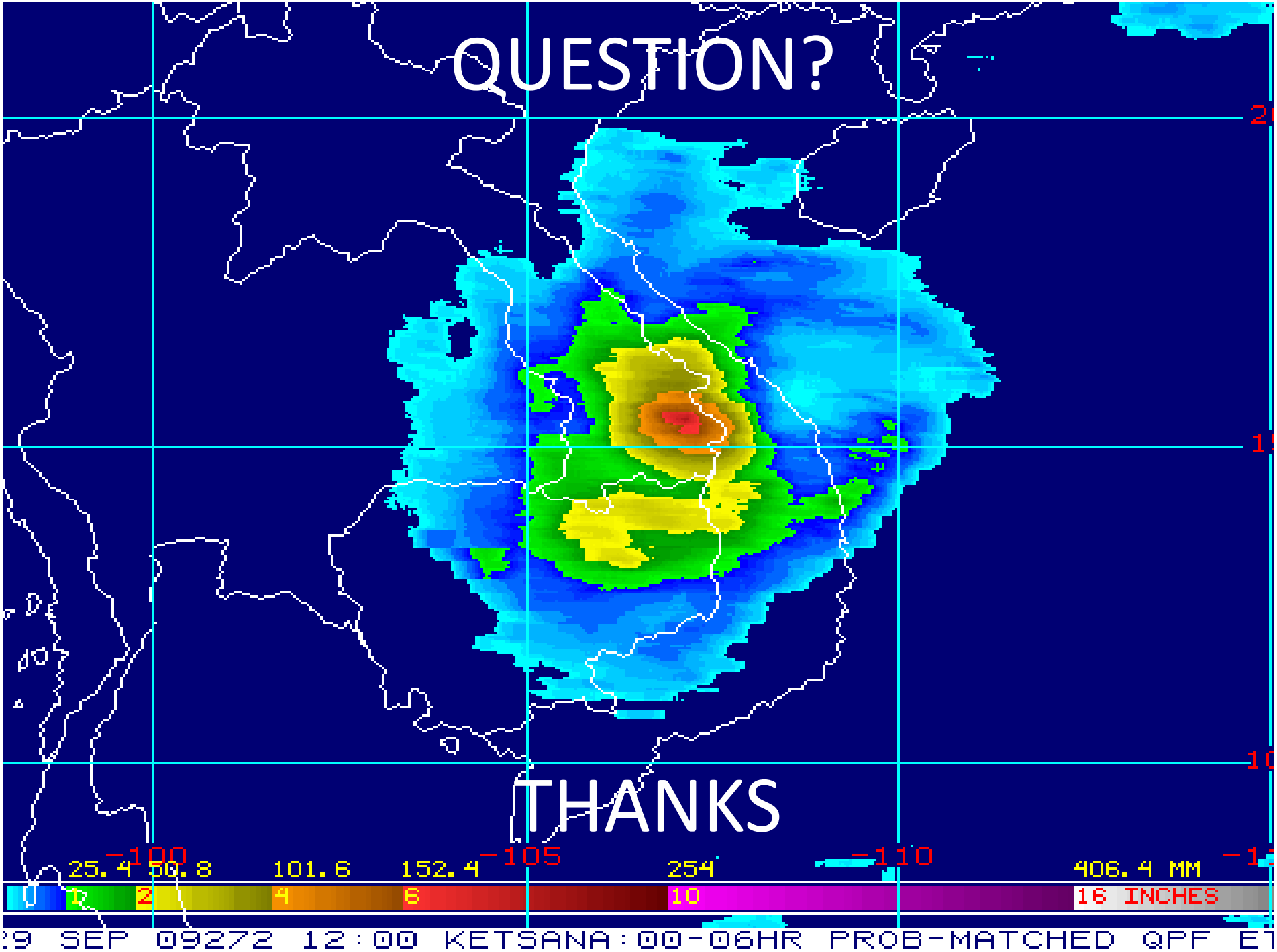
- When we compare the absolute standardized coefficient of natural disasters with D&D investment for poverty reduction, the ratio is 2.4=0.024/0.010 and the accumulated amount of D&D during three years is US$175.9 million.
- Therefore the accumulated loss from natural disaster in millions is US$442.16 = 175.9*2.4 or annually US$140.72 million using D&D scenario
- When we compare the absolute value of standardized coefficient of natural disaster and Aid, the ratio is 0.615=0.024/0.039 and the total accumulated Aid allocation in million is US$1470.3.
- The accumulated loss from natural disaster using Aid scenario is US$904.23 =1470.3*0.615 or annually US$301.41 million.

Conclusion and Recommendation

- Statistical evidence suggests that D&D and Aid allocation by donors to the sub-national level contribute to poverty reduction while natural disasters increase poverty.
- In terms of cost effectiveness of poverty reduction strategies at the sub-national level, D&D should be promoted with proper attention to addressing the perennial impact of floods, droughts, and cyclones/typhoons in order to accelerate poverty reduction and achieve the Cambodian Millennium Development Goal of halving poverty by 2015 (CMDGs 1.1).

CMDG

- **Goal 1:** Eradicate extreme poverty and hunger
- **Goal 2:** Achieve universal primary education
- **Goal 3:** Promote gender equality and empower women
- **Goal 4:** Reduce child mortality
- **Goal 5:** Improve maternal health
- **Goal 6:** Combat HIV/AIDS, malaria and other diseases
- **Goal 7: Ensure environmental sustainability**
- **Goal 8:** Develop a global partnership for development
- **Goal 9:** De-mining, UXO and victim assistance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