

Conceptualising Inventory Pre-positioning in the Humanitarian Sector:

Improving the effectiveness and efficiency in the relief
network

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Aim

Present:

- * definition & description of Inventory pre-positioning (IPP)

- * the factors affecting IPP decision making



Outline

- **Introduction**
- What is in the Literature
- Part 1
 - Describe and Define IPP
 - Decisions relevant to IPP
 - Factors affecting these decisions
- Part 2:
 - The Impact of Collaboration on IPP
 - Demand Analysis
- Conclusion & Further Research



Context of Disasters



Earthquake



Floods



Tropical storms & Hurricanes

2010, hit hard by natural disasters

	Haiti Earthquake	Pakistan Floods	China Floods, drought, dust storm, ice storms, landslides, earthquake
No. of people killed	200,000+	2,000+	3514
No. of people affected	3,000,000	21,000,000	45,000 (evacuated) 486 (unaccounted)
Estimated damage	US\$8–14 billion	20% land under water	US\$31.19 billion (economic loss)



The Challenge!

How to effectively supply those affected by natural disasters?

How to increase the efficiency of the relief chain?

One way: Through the design of the relief supply chain and the pre-positioning of inventory!



The Impact of IPP: The IFRC



	Indonesia Tsunami (2004) (Centralised)	Pakistan EQ (2005) (Centralised)	Yogyakarta EQ (2006) (Decentralised)
Days to activate the supply chain	18	10	3
Partial relief packages to families by 2 months	28,021	29,229	53,112
Av. no. families served per day	445	555	613
% goods delivered from region	13	68	100
Costs to deliver relief packages per family at 2 months (US)	Not available	860	148

(Gatignon *et al* 2010, IFRC 2010,)

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The Literature shows....

- IPP not clearly defined
 - Storage at/ near disaster for seamless delivery of critical goods (Ukkisuri & Yushimito 2008)
 - Facility location and inventory policy decisions (Balcik & Beamon 2008)
 - Facility location, inventory management, network flows (Duran et al 2007)
- Emphasis on quantitative factors
 - Budgetary constraints (Balcik & Beamon 2008)
 - Costs – inventory, transportation, delivery, restocking and salvage values (Balcik & Beamon 2008, Campbell & Jones 2010, Rawls and Turnquist 2006, Druan et al 2007)
 - Response time (Duran et al 2007)
- Minimal inclusion of qualitative factors
 - Customs clearance, level of unrest, infrastructural damage, socio-political factors (Chopra & Meindl 2007, Duran et al 2007)



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Step 1: IPP Described and Defined



The strategic positioning of inventory

integration of facility location, inventory management & transportation decisions,

key factors affecting it

Step 2: IPP Decisions



Facility Location Decisions

- Number of facilities
- Facility points
- Capacity of facility
- Allocation



Inventory Management Decisions

- Inventory Types
- Inventory Policy
- Target inventory levels, order quantities, replenishment policy



Transportation Decisions

- The number of vehicles
- Vehicle routing and scheduling
- Transportation mode
- Resource positioning

Step 3: Crucial Decisions



Factors	Where?	Whom?	What?	How much?
Collaboration	X	X	X	X
Demand forecasting	X	X	X	X
Political enviro (safety)	X			
Logistics & facility costs	X	X	X	X
Financial resources	X	X	X	X
Infrastructure	X	X		
Macro-ec factors	X			
Product characteristics			X	X

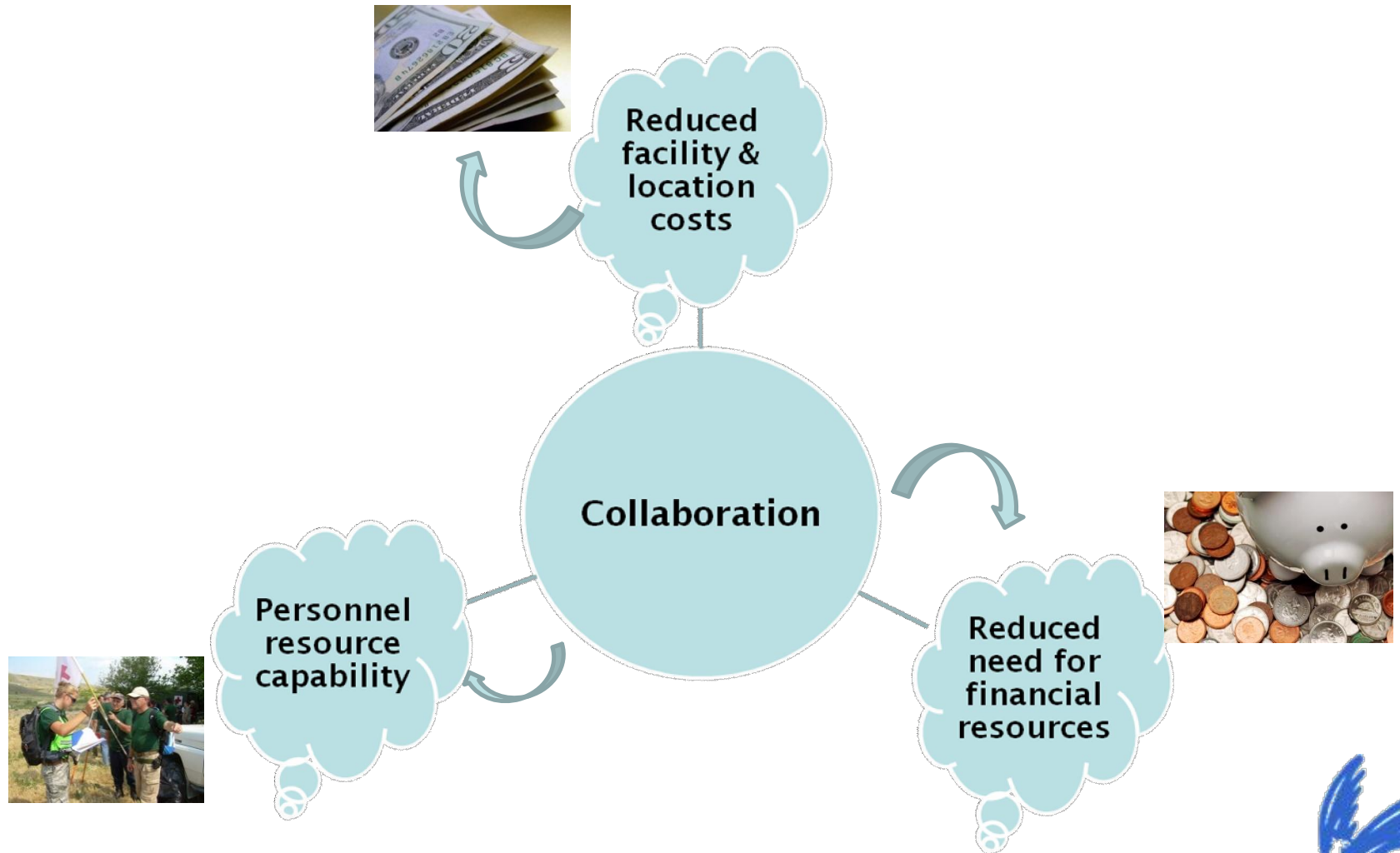


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Collaboration and IPP



Opportunities to collaboration

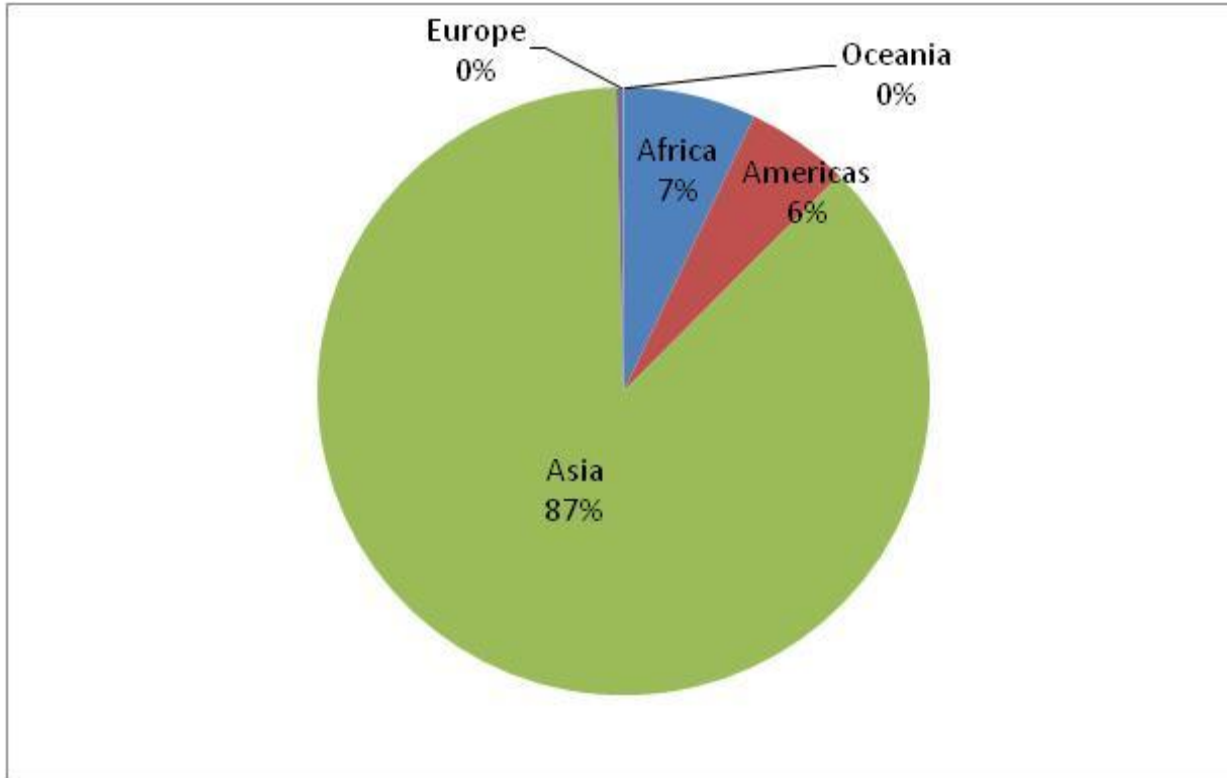
Benefits to Collaboration

	Facility & Logistics costs	Need for financial resources	Infrastructure (obtain skilled personnel)
Facility location	Shared facilities improves inventory turnover		Provide storage, handling and other functions
Inventory Management	Improves inventory turnover	Less resources needed	Inventory management decisions and inventory
Transportation	Reduced cost: Close to disaster area coordinated shipments (air crafts, trucks)	Less need due to reduced freight costs	-Management of transportation systems -Time savings in handling customs clearance
Procurement	Reduced costs: -Joint procurement procedures -Procure jointly, increase bargaining power & purchase larger quantities at lower prices		

(Compiled from Duran et al 2007, Balcik and Beamon 2008, Balcik et al 2010)



Understanding demand, Asia hit hardest of all regions (2005-2009)



EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium

The percentage (%) shows the number of people affected
87% of people affected by natural disasters in the world are in Asia



Floods have biggest impact of all disasters (2005 – 2009), mil. people

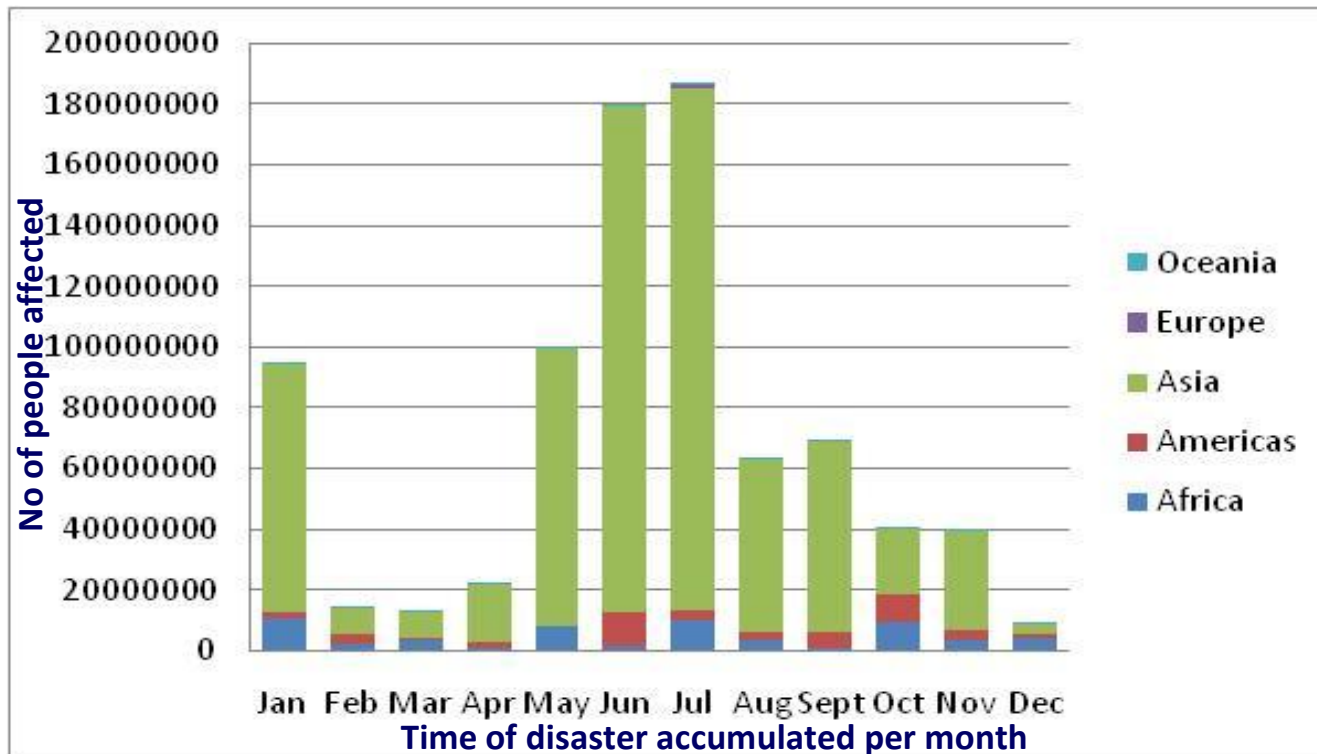
Disaster Type	Cumulative no. of people affected
Floods	386
Storm	206
Drought	91
Extreme temperature	80
Earthquake	60
Epidemic	2
Wildfire	1.2
Volcano	0.95
Insect infestation	0.5

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Source: Richardson et al (2010), Facility location project



June & July are the critical months



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- * Large number of people affected between May and November, but the peaks are in June and July.
- * The large figure in January due to extreme temperature in China in 2008 where 77 million people were recorded as being affected



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Conclusion & Further Research

- Conclusion
 1. Described & defined IPP
 2. Factors affecting IPP & Conceptual framework of IPP
- What next.....
 1. Empirical validation of IPP & important decisions for IPP
 2. Investigation of relationships amongst decisions, factors & decisions
 3. Development of the framework to assist with IPP decision making
 4. Development of solution approaches for IPP that consider factors



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