Humanitarian Operations

Bahar Yetiş Kara

Humanitarian

"a person promoting human welfare and social reform" (Webster)

"anything concerned with improving people's living conditions and preventing unfair treatment" (Longman)

Logistics

"to provide the right product, in the right place, at the right time, in the right amount, in the right way, in the right quality"

Humanitarian Logistics

"to provide the right product, in the right place, at the right time, in the right amount, in the right way, in the right quality **for humanitarian purposes under humanitarian challenges**"

Humanitarian Logistics

- World Food Programme **(WFP)**
- United Nations Children's Fund **(UNICEF)**
- United Nations High Commissioner for Refugees
- Medecins Sans Frontieres

*"**Humanitarian logistics** is the process of planning, implementing, controlling the efficient, cost effective flow and storage of goods and materials, as well as related information, from point of origin to point of consumption for the purpose of meeting the end beneficiary's requirements."*

Humanitarian Logistics

involves processes and systems involved to mobilize people, resources, skills and knowledge to deliver humanitarian assistance to people in need

Humanitarian Assistance

- Humanitarian aid is material or logistical assistance provided for humanitarian purposes, typically in response to humanitarian crises including natural disaster and man-made disaster.
- The primary objective of humanitarian aid is to save lives, alleviate suffering, and maintain human dignity.
- It may therefore be distinguished from development aid

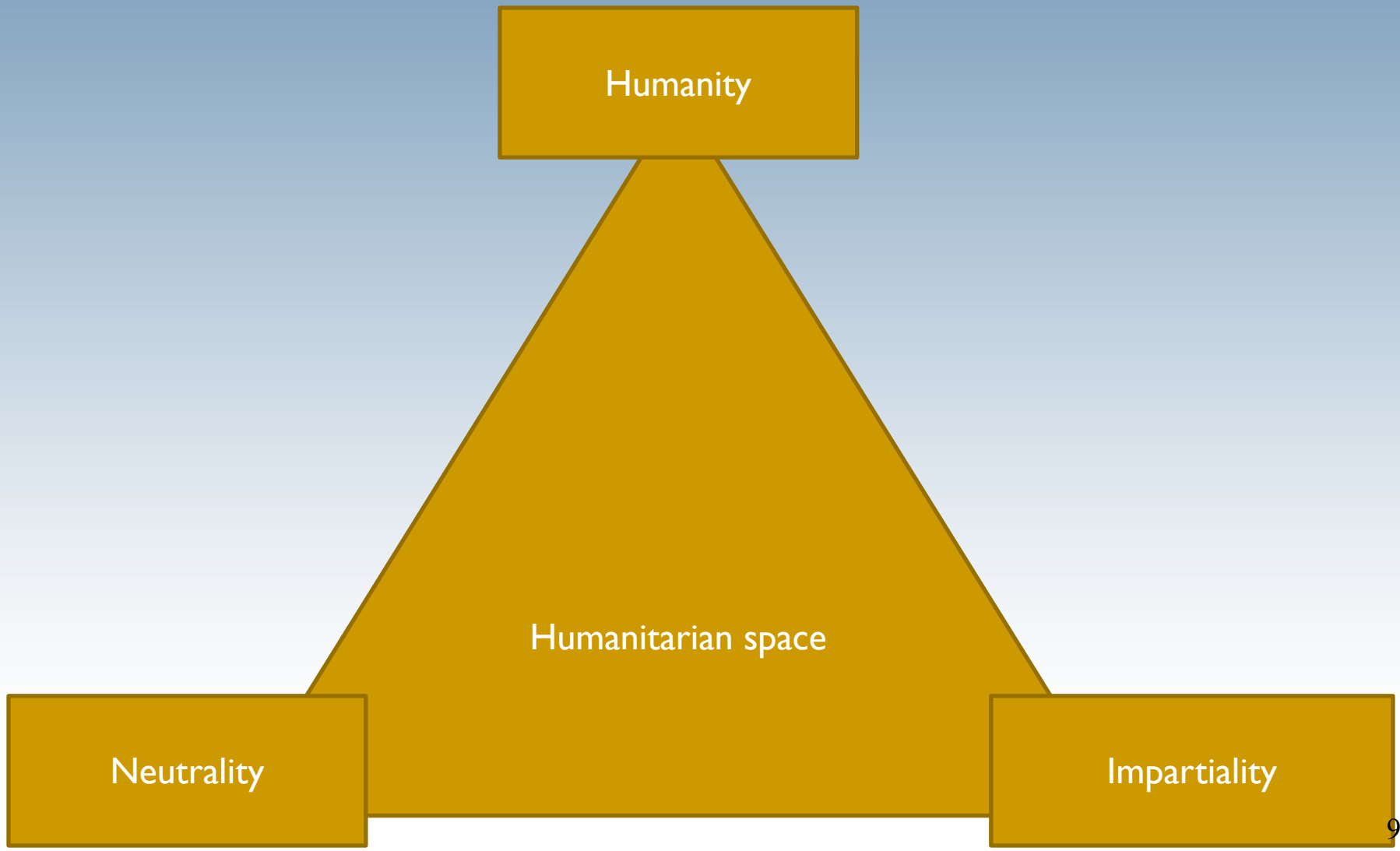
Humanitarian Assistance

- Objectives:
  - save lives,
  - equitable, reliable, efficient and effective service,
  - alleviate suffering and maintain human dignity during and in the aftermath of man-made crises and natural disasters,
  - prevent and strengthen preparedness for such situations,

'A successful humanitarian operation mitigates the urgent needs of a population with a sustainable reduction of their vulnerability in the shortest amount of time and with the least amount of resources' (Tomasini and Van Wassenhove, 2004c).

Source: Principles and Good Practice of Humanitarian Donorship, Stockholm, 17 June 2003, http://www.goodhumanitariandonorship.org/

Principles



Principles

- Humanity: meaning the centrality of saving human lives and alleviating suffering wherever it is found (**Will assist everyone in need wherever found**)

- Neutrality: meaning that humanitarian action must not favor any side in an armed conflict or other dispute where such action is carried out (**Process without bias or affiliation to a party**)

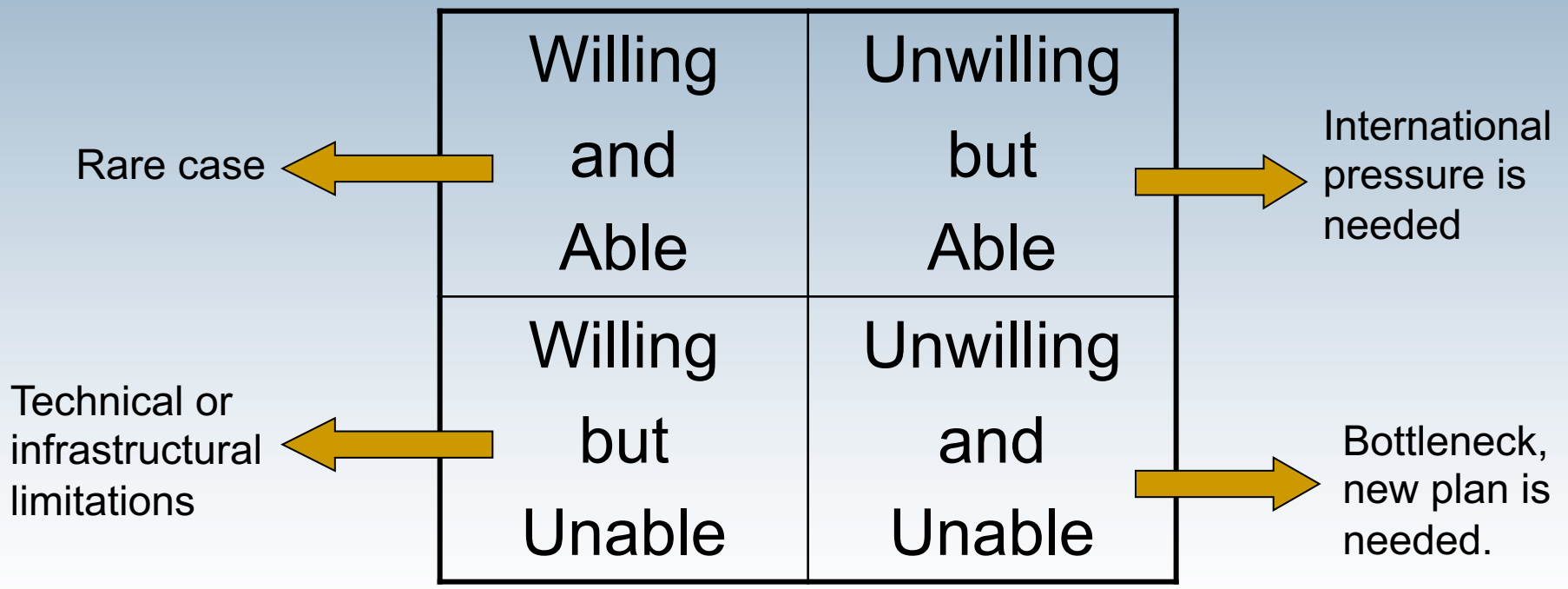
- Impartiality: meaning the implementation of actions solely on the basis of need, without discrimination between or within affected populations

The Humanitarian Challenge

- 1- Ambiguous Goals
  - Operationalizing 3 principles at the same time can be ambiguous.
- 2- Impact
  - It is hard to predict long-term results.
- 3- Levels of Influence
  - At what level (local, national or international) should the impact be measured?
- 4- Political-Humanitarian Relations
  - Politics always take role in some part of humanitarian actions. However, they must be ruled out.
- 5- Funding
  - Adequate funding is needed to send aid.
  - Donors tend to respond short-term needs rather than long-time needs
- 6- Willingness and Consent

The Humanitarian Challenge

- 6- Willingness and Consent



The Humanitarian Challenge

- Objectives, performance measures
  - Ambiguous
  - Hard to quantify
  - Limited data

The Humanitarian Challenge

- Limited resources
  - Workforce, cash, supply…
  - Relies on voluntary workforce and/or donations
  - Time as a scarce resource: sense of urgency

The Humanitarian Challenge

- Multiple stakeholders
  - Sometimes conflicting interests
  - Lack of transparency, cooperation & coordination
  - Politicized environment

The Humanitarian Challenge

- Information/material flow
  - Geographical challenges
  - Possible disruptions of infrastructure and other technology

Players / Stakeholders

Donors & Suppliers & Policy-makers	Recipient agency	Delivering agency

• Government
• Foundations
• Companies
• Individuals
	• NGOs
	  • IFRC
	  • Word Vision
	  • WFP
	  • CARE
	  • RedCross
	  • …
	• Governments
		• Global or local NGOs
		• Local organizations or governments
		• Military

Media

People in-need

Coordination and collaboration is key!

Demand Drivers

- Type, magnitude, location of the disaster
- Vulnerability
  - Local infrastructure
  - Education
  - Local economy
  - Access to resources
  - Local government and institutions,
  - Population size,
  - Recent events
- Local capacity

Supply Types

- Relief items
- Personnel / volunteers
- Other resources

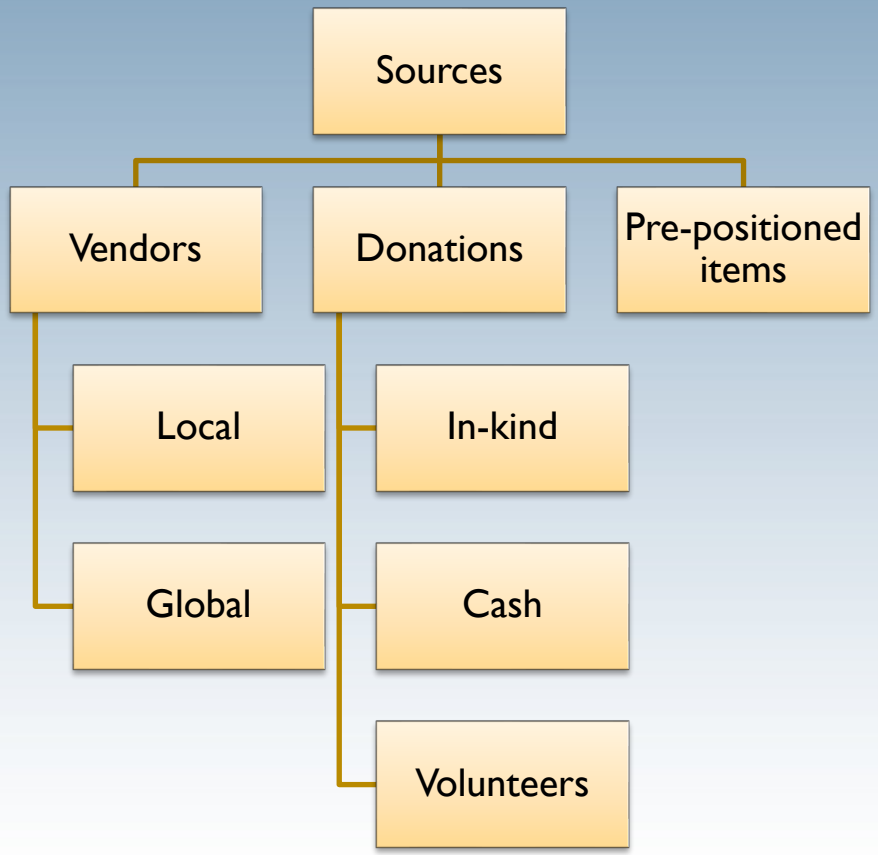
Supply Types

Relief Items

- **Consumables**
  - 
- **Non-consumables**
  - **Operational**
    - 
  - **Non-operational**
    - 

Supply Sources

- Procure after the fact
  - Most donations are earmarked for a particular disaster
- High uncertainty in the quantity, timing, and the type of donations.
- Competition among NGOs for supply sources
- Trade-off in the choice of suppliers
- Supply availability highly depend on the location



PROS	CONS
Local suppliers	
Stimulate economy	Low quality
Low transportation cost	Lower availability
Faster response	Higher prices
Global suppliers	
Higher availability	Slower response
Higher quality	Higher transportation cost
Lower prices	–

Challenges with Donations

- Right product? Right place?
  - South African Food Crisis in 2002
    - Worst food crisis in Africa in a decade
    - Most of the food donated by the US government
    - Rejected by local governments, stockpiles at ports or in transit
  - Inappropriate donations can cause bottlenecks in the supply chain

DISASTER RESPONSE

Differing / overlapping aid assessments logically cause problems of oversupply / inappropriate supply.

1988 Armenian Earthquake	• Tons of drugs & other medical supplies expired, unused.
Famine in southern Africa in 2002	• Well-meaning organizations donated tons of genetically modified food
Tsunami in southeast Asia	• Large amounts of donated clothing were not needed & caused problems for aid agencies (transportation-storage)

Donation management

Donation pollution is caused by

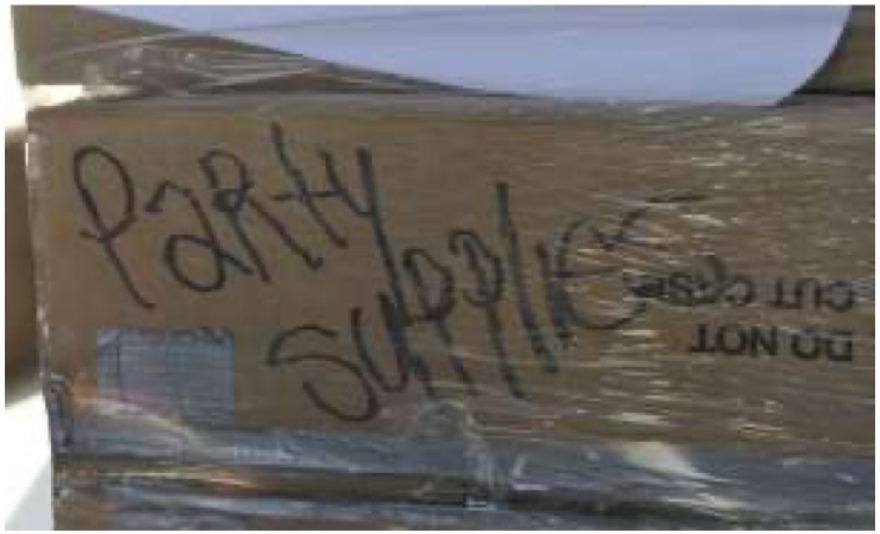
- Unsolicited,
- Inappropriate,
- Excessive

gifts-in-kind.

Donation Pollution

- Unless a relief organization already has a process in place for identifying and preventing unsolicited and inappropriate donations from entering their system, the extra effort of separating, prioritizing, transporting, and storing these items results in delays and increased logistics costs (Fritz Institute, 2005).

- Haitian authorities have reported that 60% of donations sent after the 2010 disaster were not needed and that only 5-10% satisfied urgent needs.
- During the response to the 1993 Bangladesh Earthquake, unwanted goods constituted 95% of all goods received (Chomilier et al., 2003)



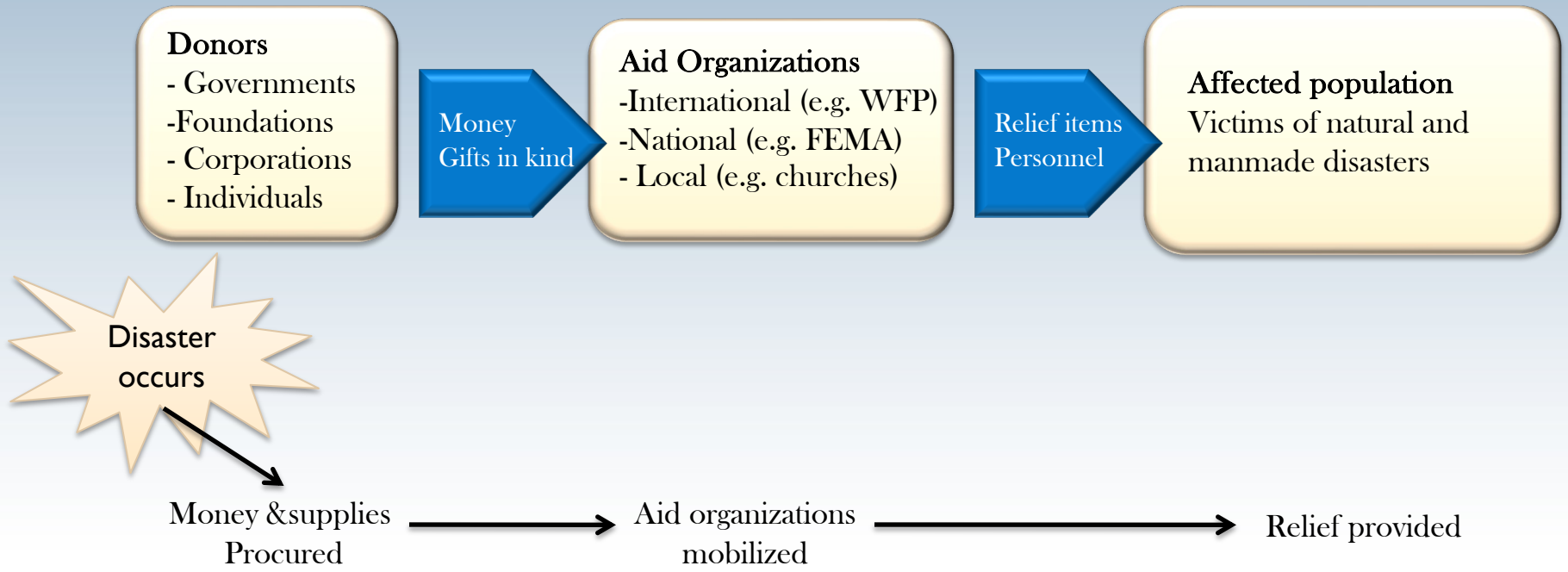
An example of inappropriate items (delivered to Haiti after the January 2010 Earthquake)

Donation Pollution

- They can put pressure on an already-stretched humanitarian supply chain system and incur many thousands of dollars in storage and handling fees. They can also have a substantial environmental impact if they need to be destroyed and become landfill in a region where safe waste management options are scarce (Source: https://ndmo.gov.vu).

HUMANITARIAN RELIEF SUPPLY CHAIN

HOW Humanitarian organizations form part of a supply chain (SC) ???



Humanitarian Supply Chain (Kara and Rancourt, 2019)

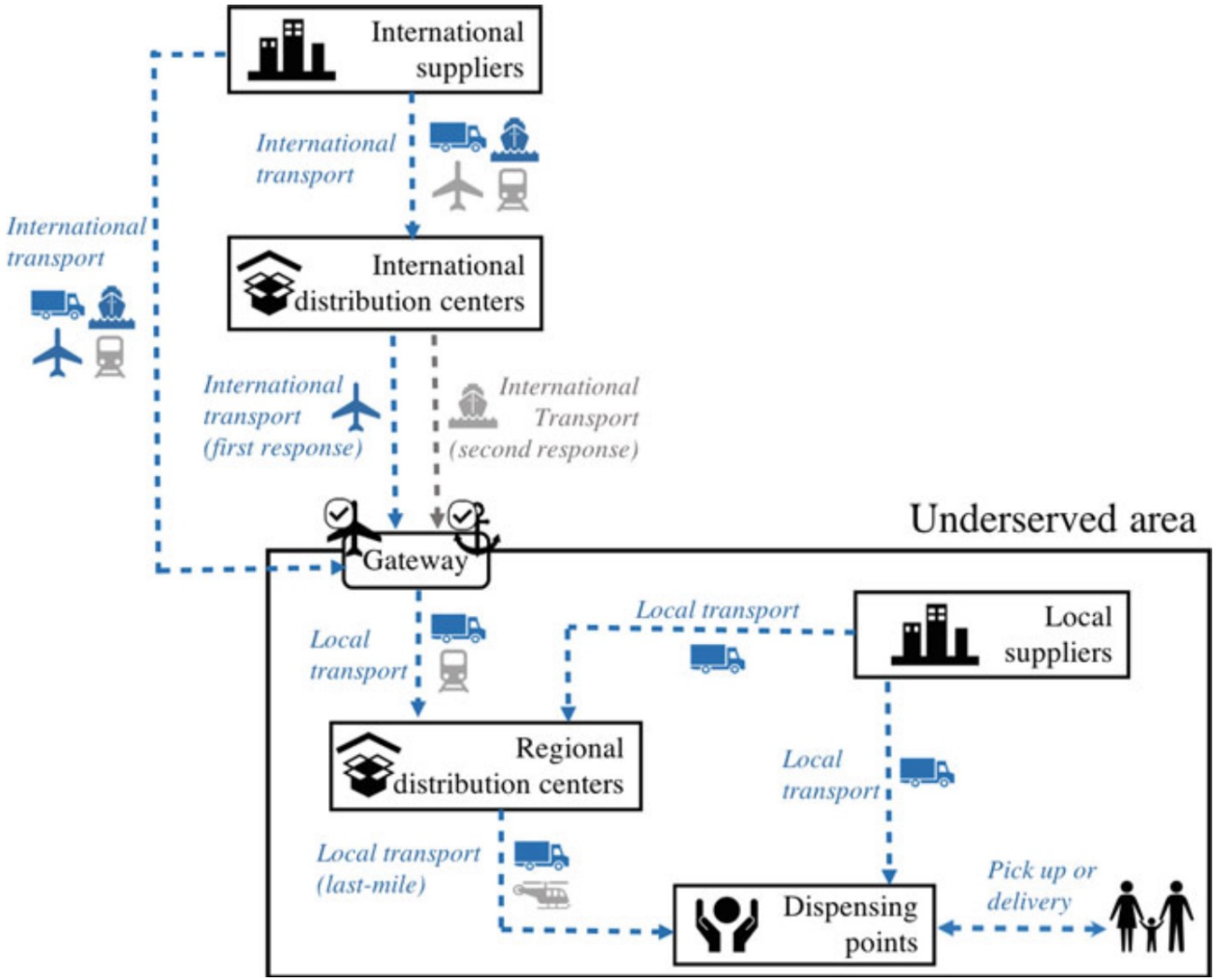
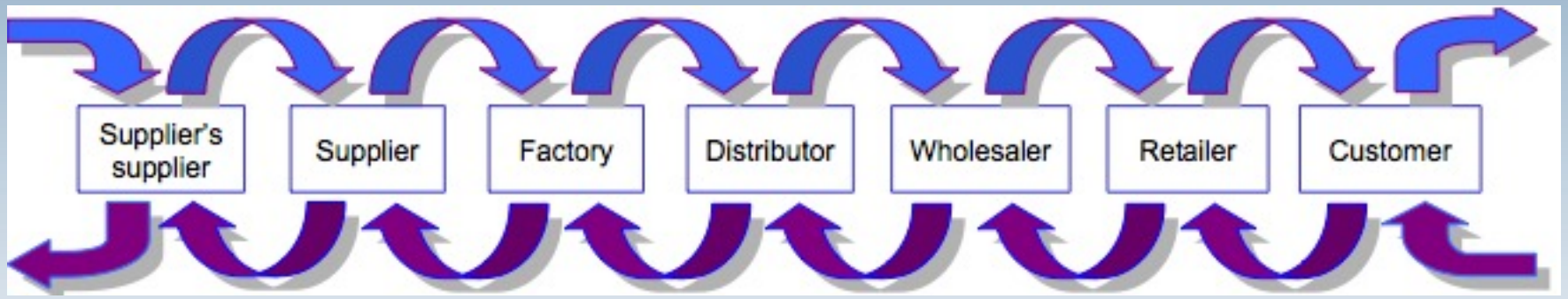


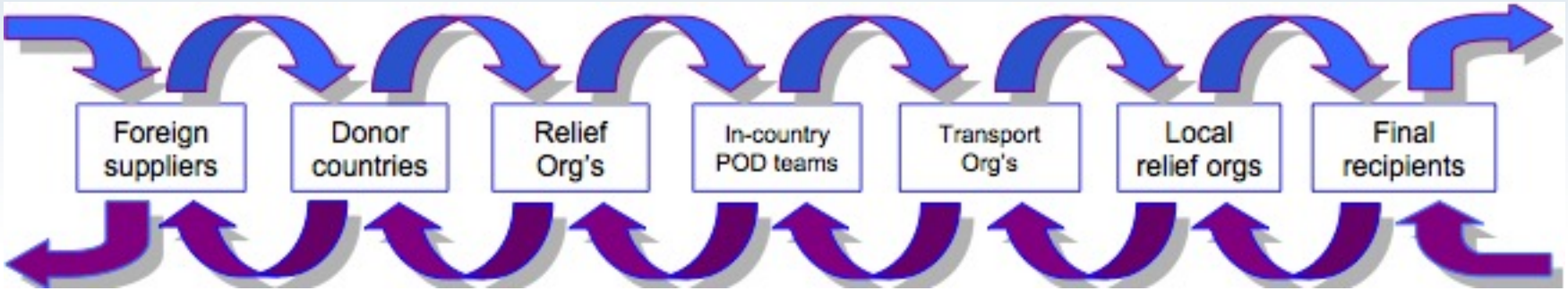
Fig. 21.1 Humanitarian supply chain

Business SC vs. Humanitarian SC

- Supply Chain: The system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer.



- "Products" are relief supplies arriving in-country



Business SC vs. Humanitarian SC

- Business supply chain is
  - Demand driven.
  - Planning is made according to business needs.
- Humanitarian supply chain is
  - Supply driven.
  - Planning is made according to on hand stock (donations).

Business SC vs. Humanitarian SC

- Business SC: Min cost, max speed, quality and flexibility
- Humanitarian SC: Acute emergency, max speed, equality.
  - Reduce waiting time, delays, excessive control and bureaucratic processes
  - Also, poor collaboration leads to delays

Risks within Humanitarian SC

- Distruptions
  - As SCs become more global, they grow more complex and geographically dispersed.
- Coordination
  - Risks of matching supply and demand with the given budget constraints

Delivery

- Long haul and last mile
  - Financial, staff, equipment, supplies
- Transportation & Communication infrastructure
  - Highly dependent on the location
  - May be damaged or disrupted
  - Dynamically changing conditions
- Political situation in the affected area and around

The logistics costs for disaster management are around 80% of total costs in disaster relief (Wassenhove, 2006)

Food Aid (Some Facts)

- The dominant response to food crisis
- Constitutes over half of all UN consolidated emergency appeals
- 17% of non-food needs identified in the recent UN appeals for Kenya, for example, were funded, compared to 46% of food needs
- Imported food aid can take up to 4-5 months to arrive
- Food aid may cost as much as 50% more than local food, and may be nutritionally limited and culturally inappropriate
- In 2004, Canada spent up to 40% of its food aid budget on transportation before policy change.

79% of food aid is sourced in donor countries

US sources 99% of food aid domestically

Denmark, France, Italy largely support food aid domestically

source: Causing Hunger: an overview of the food crisis in Africa, Oxfam briefing paper, 24 July 2006

US Food Aid

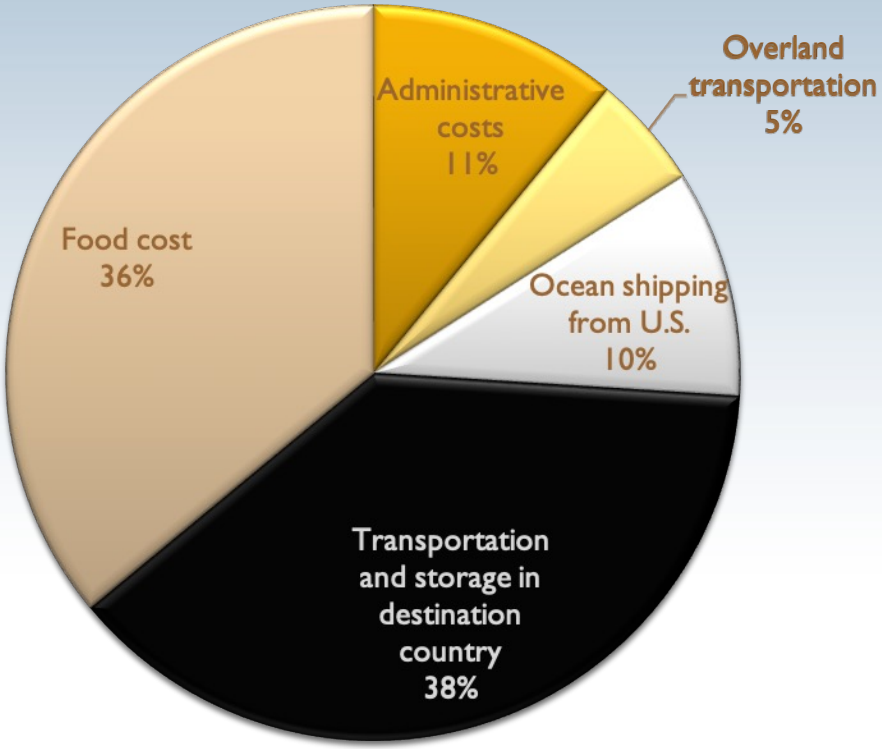
- USAID – cost of transportation is 65% of the total expenditure for emergency food
- Buying locally saves approximately 50% of total cost
- US food aid system set up to benefit US business interests, rather than to deliver aid effectively.
- Some US NGOs have a conflict of interest regarding commodity food aid, since they rely on sales of food aid to finance development programs

source: Sophia Murphy & Kathy McAfee, US Food Aid: Time to Get It Right, Institute for Agriculture and Trade Policy, July 2005, http://www.tradeobservatory.org/library.cfm?refid=73512

source: Causing Hunger: an overview of the food crisis in Africa, Oxfam briefing paper, 24 July 2006

Example

- Because of administration and transportation costs, less than half of the money spent on USAID food aid actually goes to pay for food.
- TOTAL 2022 USAID FOOD AID EXPENSES



Disaster

"A Serious disruption of the functioning of the society, causing widespread human, material, or environmental losses that exceed the ability of the affected society to cope using only its own resources" (United Nations Department of Humanitarian Affairs)

"Result of a vast ecological breakdown in the relationship between man and his environment, a serious (sudden or slow) disruption on such a scale that the stricken community needs extraordinary efforts to cope with it" (WHO)

"A disruption that physically affects a system as a whole and threatens its priorities and goals." (Wassenhove, 2006)

Disaster- Emergency- Mass Casualty Incident

- Disaster-emergency difference
- While a disaster by definition overwhelms response capabilities, a mass casualty incident (MCI) occurs more commonly and is defined as a situation that places a significant demand on medical resources and personnel (Noji and Kelen, 2000)

Disasters:

- CDR : Crude Death Rate
- U5DR : Under-Five Death Rate
- Public emergency: if CDR doubles
- Acute emergency: if more
- Thresholds depend on baseline CDR
- Accuracy of baseline values
- Thresholds differ by country/region

Source: https://emergency.unhcr.org/

IFRC categorizes disasters into 14

- Earthquakes
- Landslides
- Avalanches
- Heat waves
- Wildfires
- Cyclones
- Volcanic eruptions
- Tsunamis
- Floods
- Cold waves
- Droughts
- Epidemics & pandemics
- Hailstorms
- Technological and biological hazards

Classification

- Disaster Relief

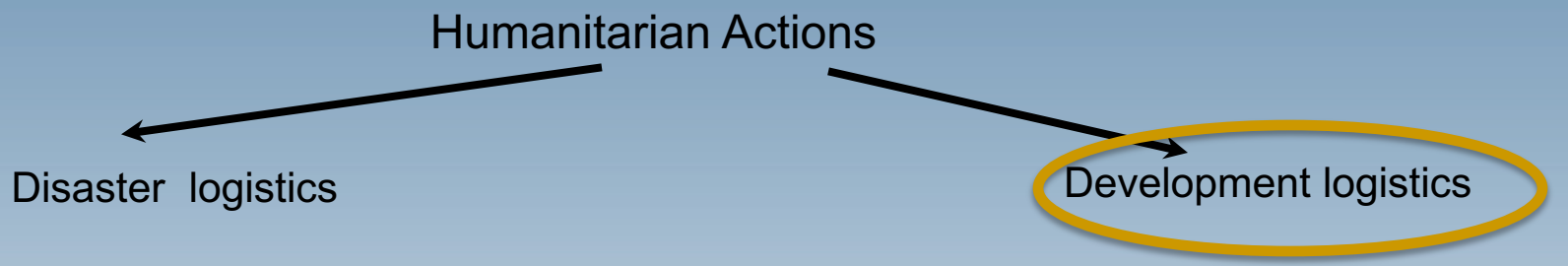
- Continuous Actions

Public Sector Examples

- Improving the performance of fire and police departments
- Delivery of meals to senior citizens (Meals-on-Wheels)
- Delivery of blood to hospitals
- Housing
- Drug Policy – Enforcement vs Treatment?
- Guns and violence
- Public transportation

Routine events vs Disasters

Humanitarian Actions



Public Sector Applications

Humanitarian Actions

- Analysis depends on where we are
- Humanitarian supply chain is mainly disaster logistics
- Both disaster and development Logistics has many different OR problems

Development Logistics

- Continuous Improvement

- Projects for 3rd world countries

Projects for 3rd World Countries

- Hunger
- Health
  - Malaria, HIV, ..
- Education
  - Children, Adults, …
- Water
- …

Many specialized NGOS

e.g Tutu Foundation for HIV
Malaria Foundation International
…

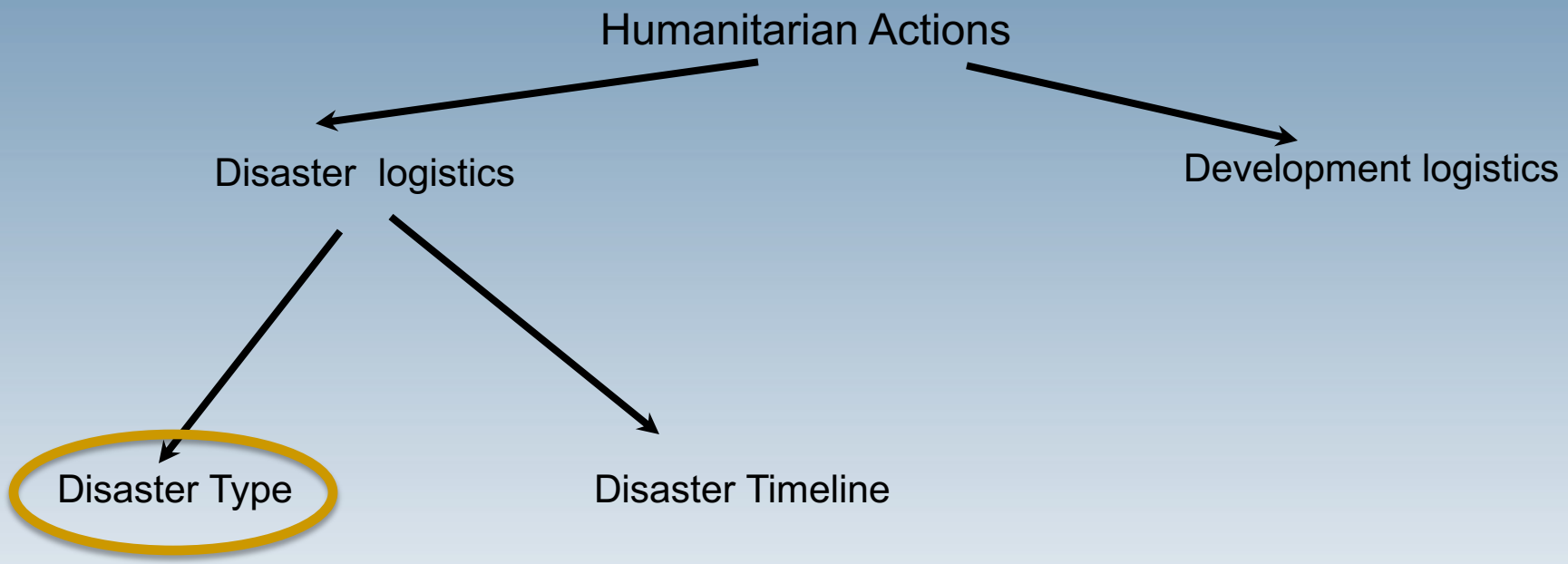
Many OR problems

Development Logistics

- Continuous Improvement:
  - Hospital, ambulance coverage
  - Fire station coverage
  - Senior Citizen Services (E.g. Meals-On-Wheels)
  - Sustainability (e.g. energy consumption, green logistics)
  - Education
    - Districting, school sites…
  - Healthcare
    - Hospital logistics,
    - Blood Logistics,
    - Mobile Primary Healthcare
    - Childcare, maternal care especially for rural areas

Many OR problems

Humanitarian Actions



Disasters

Natural

Human-Made

Slow Onset
-Famine
- Drought

Sudden Onset

Slow Onset
- Political Crisis
- Refugee Crisis

Sudden Onset
- Terrorist Attack
- Chemical attack

Unpredictable Location
- Tsunamis

Predictable Location

Predictable Timing
- Hurricanes
- Floods

Unpredictable Timing
- Earthquakes
- Volcanic Eruption

Source: Keskinocak ISYE

Humanitarian Actions

DISASTER MANAGEMENT CYCLE

DISASTER MANAGEMENT CYCLE

Disaster Timeline

Pre-disaster | Disaster | Post-disaster

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Pre-disaster | Disaster | Post-disaster

Mitigation & Preparedness

- Assessment
  - Risk Factors
  - Vulnerability
- Planning
  - Infrastructure
  - Policy Making
  - Capacity building
  - Pre-positioning resources
  - Scenario studies
- Training / Education
- Technology development

Disaster Timeline

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Response

Relief Operations:

- Acute phase
  - Medics, food, shelter
- Then
  - Housing
  - Food supply chain building

Logistics stages:

- Mobilization and procurement,
- Long haul
- The last mile

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Recovery

- Debris cleaning
- Infrastructure rebuilding
- Re-establishing communities
- Measure the effects of
  - Infrastructure
  - Planning
  - Response
    - Short and long term
- Lessons learned
- Feedback to planning and response

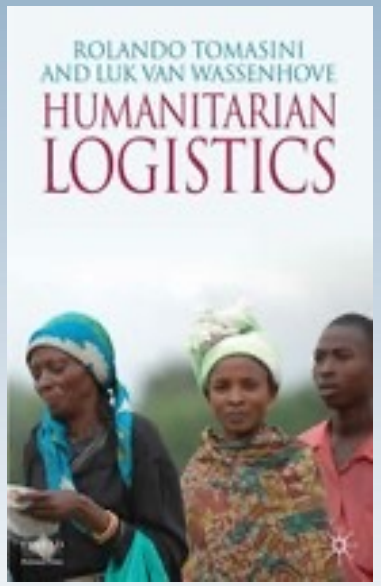
FULL CYCLE OF DISASTERS

1. Mitigation
   - Laws and mechanisms that reduce vulnerability
2. Preparedness
   - Putting in place the response mechanisms to counter factors
3. Response
   - Acquiring data, planning and sending aid
4. Rehabilitation
   - To restore some form of normality to the victims' lives

Humanitarian Actions

Humanitarian Actions

- Disaster logistics
  - Timeline
    - Pre-disaster (mitigation & preparedness)
      - * assessment
      - * planning
      - * training/education
    - Disaster (response)
      - * relief operations
      - * second phase
      - * logistics stages
    - Post-disaster (recovery)
      - * debris cleaning
      - * measure the effect of
        - -infrastructure
        - -planning
        - -response
      - * short & long term
      - * lessons learned
  - Type
    - Complex emergencies (Human-made disaster)
    - Natural disaster
      - Slow onset
        - -Famine
        - -Drought
      - Sudden onset
        - Unpredictable Location
          - -Tsunami
        - Predictable Location
          - Predictable Timing
            - -Hurricane
            - -Flood
          - Unpredictable Timing
            - -Earthquake
            - -Volcanic eruption
- Development logistics
  - Health
  - Education
  - Food
  - Sustainability
  - ...



PREPAREDNESS

Based on "Humanitarian Logistics"
by R. Tomasini and Luk Van Wassenhove

HURRICANE MITCH

- Roads are washed out, 400 bridges are destroyed in the region
- 10,000 death and 2 million homeless
- Nothing went right in response of IFRC
- Staff and relief delegates arrived unreasonably late
- Emergency Response Unites (ERU) deployed too late
- IFRC caught unprepared, failed to coordinate and consider prepositoning
- Successful responses are not improvised = Firefighting

FIREFIGHTING

- There is not enough time to solve all the problems
- Solutions are incomplete
- Problems recur and cascade
- Urgency supersedes importance
- Many problems become crises
- Performance drops

PREPAREDNESS CHALLENGES

Materials	• To get the right goods to the right place at the right time • SC studies show that 95% of time and resources wasted in waiting • Reduction of this percentage can save lives
Information	• Very limited at the beginning • Critical to understand impact on specific areas • Important in designing an effective SC
Funds	• Finding funds to support preparedness is difficult • Media exposure is able to raise funds • Liquidity (disaster response fund-raising) is important.
People	• Getting trained staff to the disaster areas is not easy. • Possibility of exhaustion under high physical and emotional demands
Knowledge	• Specialized knowledge is required to make quick decisions under uncertainty • Opportunity for knowledge transfer and capacity building from every disaster

5 KEY BUILDING BLOCKS OF PREPAREDNESS

1. Human Resources

   Well selected, adequately trained people.

2. Knowledge Management

   Collecting, using and sharing data

3. Logistics

   Determining the strategies to send aid (warehouse management, training, reporting)

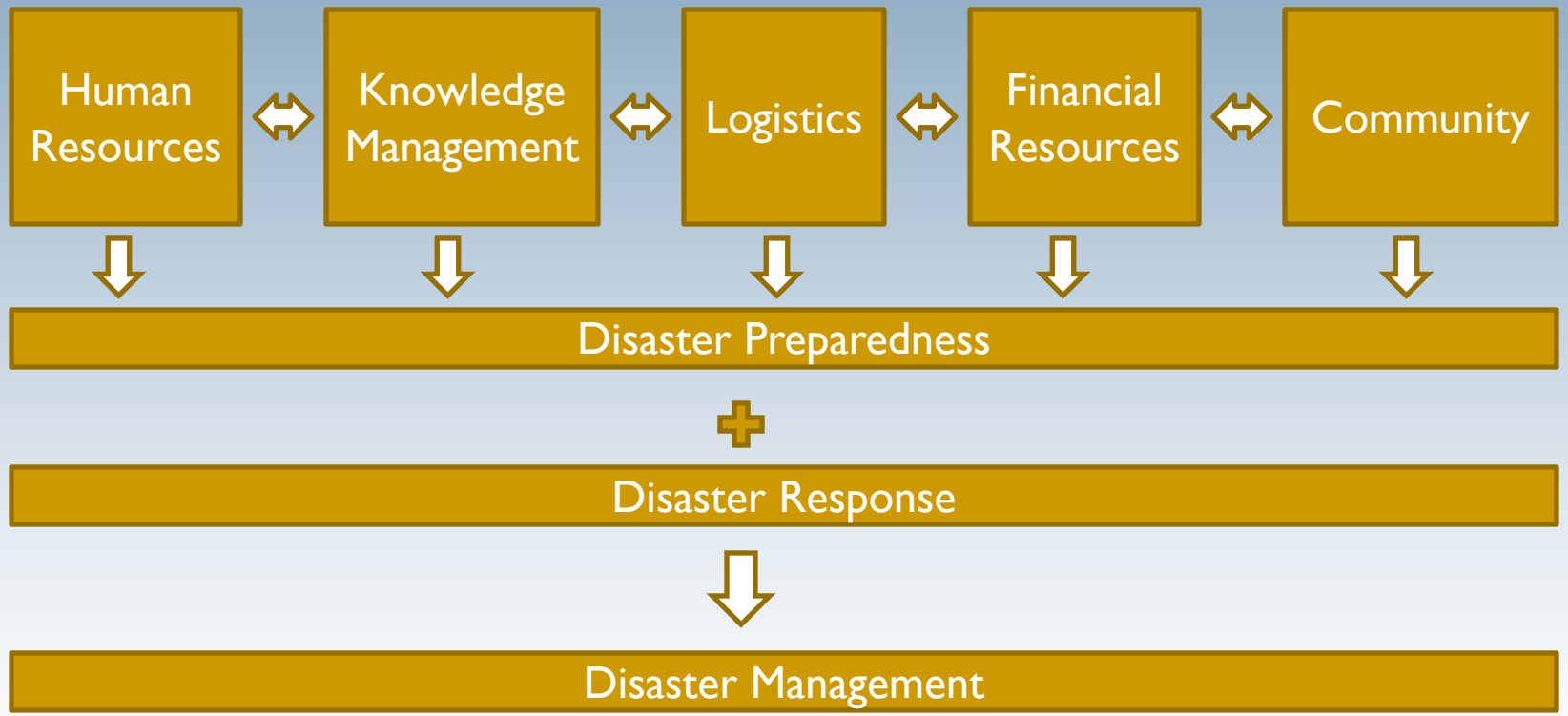
4. Financial Resources

   Liquidity, fundraising and budget forecasting

5. Community

   Finding effective ways of collaborating with other key players

5 KEY BUILDING BLOCKS OF PREPAREDNESS



PUT AN END TO FIREFIGHTING

- TACTICAL:
- Add problem solvers with relevant skills
- Shut down operations that worsen process
- Select and prioritize problems
- STRATEGICAL:
- Change design strategy
- Outsource with right capacity and skills
- Cluster problems to solve in groups
- CULTURAL:
- Do not tolerate firefighting and enforce objectives
- Do not push deadlines at all cost and try to understand changing conditions in the field

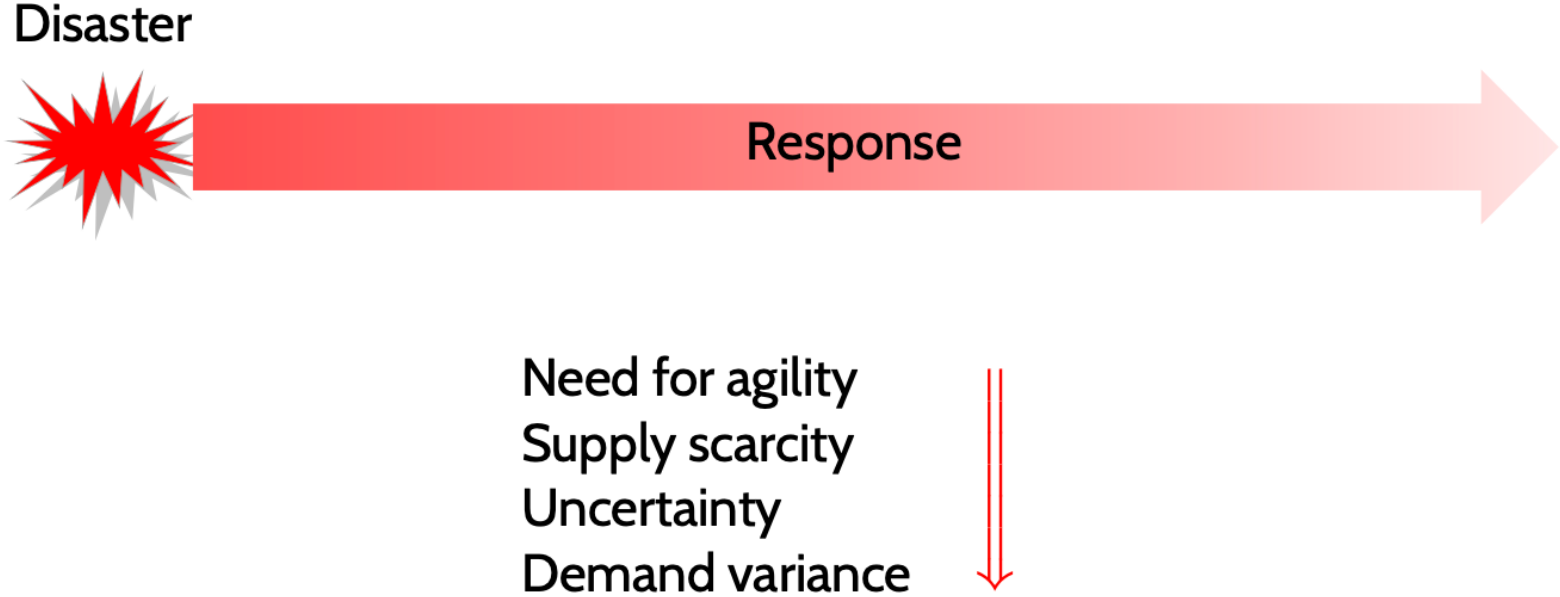
CONCLUSION

- ✓ Being prepared increases the response capacity
- ✓ "Capacity building"
- ✓ A well-prepared response is much more effective
- ✓ SC should be at the center of preparedness strategy of any organization to improve flows
- ✓ These flows will be supported by organization's

"5 Building blocks of preparedness"

RESPONSE

DISASTER RESPONSE



DISASTER RESPONSE

Gathering areas → Shelter sites → Demand-driven supply

PHASE 0
Search & Rescue

- Status assessment
- Coordination centers
- Logistics of emergency response teams & equipment
- Prioritization
- Emergency health services, first aid, casualty management

PHASE 1
S&R, Humanitarian aid

- Distribution center management
- Coordination center management
- Mobile support units (tent, blanket, food, etc.)
- Regional depots
- Donation management

PHASE 2
Humanitarian aid, S&R

- Distribution center management
- Coordination center management
- Shelter management
- Donation management
- Special needs

PHASE 3

- Supply chain management
- Debris management
- Long-term needs

OR PROBLEMS IN DISASTER RESPONSE

OR Problems in Phase 0

Damage/status assessment via drones

Decisions	Service/item type	Objectives	Uncertainties	Limitations
Facility location	Physical materials	Response time	Network link capacities	Number of facilities
Vehicle routing	Workforce	Coverage	Supply type	Size of the fleet
Resource allocation	Equipment	Accessibility	Supply amount	Capacity
Team formation	Fleet	Fairness	Demand locations	Competency levels
Team scheduling	Accommodation	Reliability	Demand amount	
Clustering/ prioritization		Cost		
Network design				

Status assessment via drones

- Fast screening of the area
- Flight range of drones
- Charging stations
- Limited drone fleet size
- Affected by the information flow limitations

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Distance constrained VRP

OR Problems in Phase 0

Emergency access routes

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Emergency access routes

- Critical emergency response services
  - Search and rescue
  - Emergency healthcare & casualty transportation
  - Security
- Prioritization of nodes
  - Critical points
- Reliable network design
  - Disruption risk of network links
  - Consideration of multiple disasters/aftershocks
- Road clearance
- Traffic assignment

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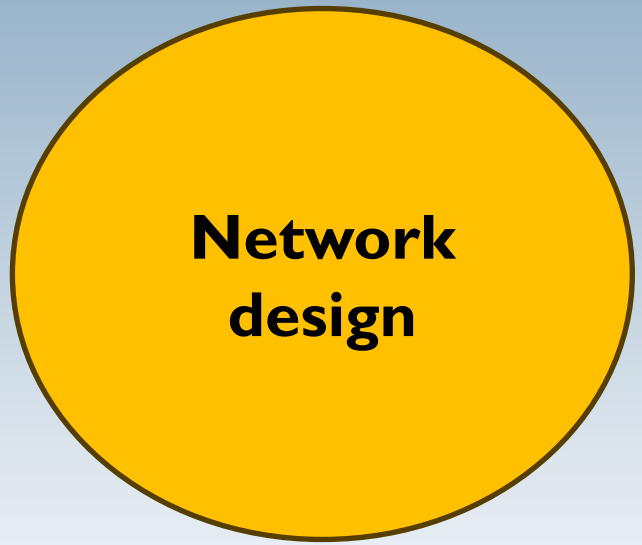

OR Problems in Phase 0

Primary logistics & coordination centers

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Network design				

Primary logistics and coordination centers

- Location at various levels: local, regional, national etc.
- Essential for communication and coordination
- Responsible from information flow and monitoring
- Logistic support for national and international workforce
  - Local guidance required for the last-mile service/delivery

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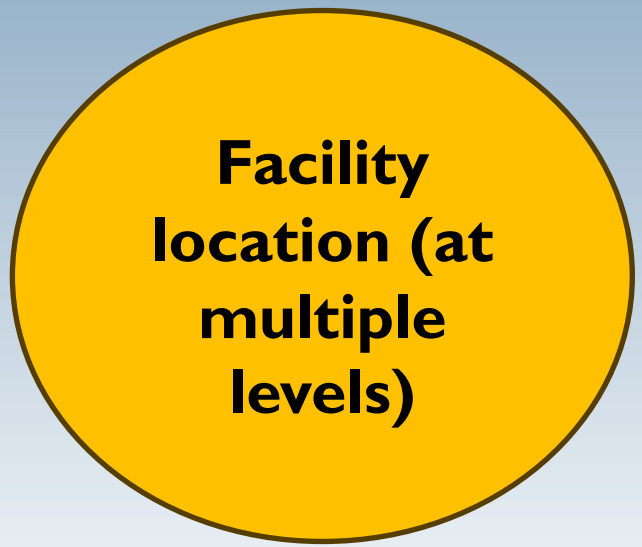
- Logistic support for national and international workforce
  - Local guidance required for the last-mile service/delivery



OR Problems in Phase 0

Emergency response teams: Search and rescue, healthcare, security

Decisions	Service/item type	Objectives	Uncertainties	Limitations
Facility location	Physical materials	Response time	Network link capacities	Number of facilities
Vehicle routing	Workforce	Coverage	Supply type	Size of the fleet
Resource allocation	Equipment	Accessibility	Supply amount	Capacity
Team formation	Fleet	Fairness	Demand locations	Competency levels
Team scheduling	Accommodation	Reliability	Demand amount	
Clustering/ prioritization		Cost		
Network design				

Emergency response teams: SAR, Healthcare, Security

- Prioritization of demand nodes based on
  - Vulnerability
  - Disaster effect
- Set of services differentiated based on
  - Demand frequency
  - Required skill set
- Team collaboration
- Joint scheduling with equipment + fleet
- Volunteer workforce management
- Needs of the teams:
  - Critical needs: food, water, shelter…
  - Resting time
  - Work safety: secondary disasters, PPE

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Scheduling, task assignment, Capacitated VRP

OR Problems in Phase 0

Casualty management/transportation

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Casualty transportation

- Prioritization of patients based on severity level
- Decreasing survival probability with time
- Patient referral
  - Air transportation
- Fatality management
  - Proper handling
  - Identification

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Resource allocation, VRP with time windows

OR Problems in Phase 1

Mobile support units for critical needs

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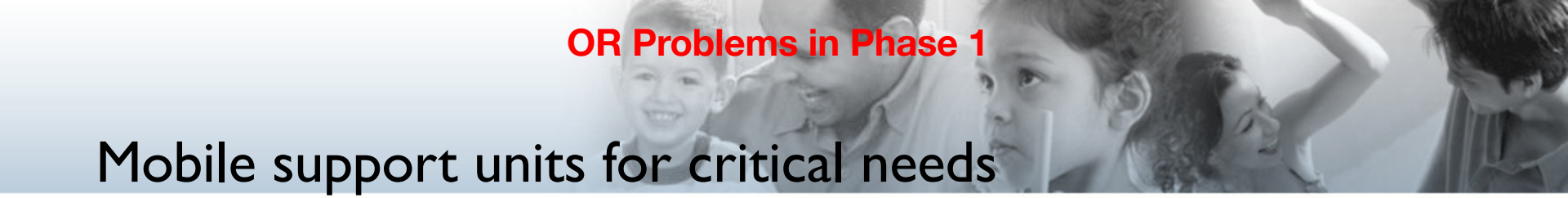
Network design				



Mobile support units for critical needs

- Prioritization of demand nodes
- Various services and relief items provided: food, hygiene etc.
- Specific needs:
  - Women, children, elderly etc.
- Area coverage vs point coverage
- Selection of stopping points


MOBİL DUŞ
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T.C.
ANKARA
BÜYÜKŞEHİR
BELEDİYESİ
MOBİL DUŞ
MOBİL SICAK SU


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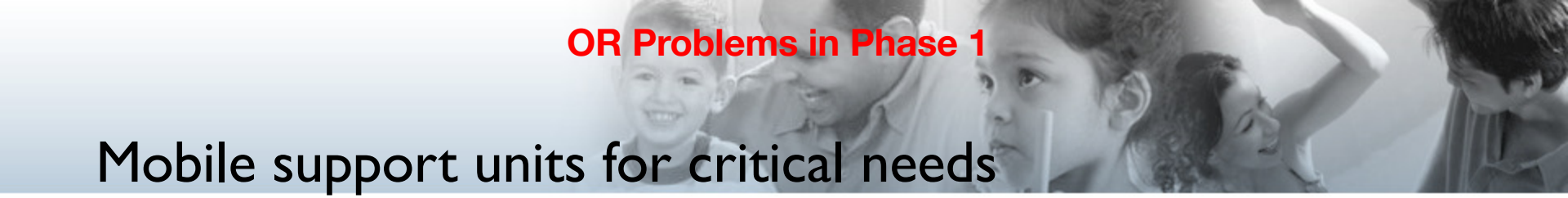
DİSSİAD
TDB
MOBİL DIŞ KLİNİĞİ
MOBILE DENTAL CLINIC


GEZİCİ ECZANE
TÜRK ECZACILARI
BİRLİĞİ



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Location-routing problem

OR Problems in Phase 1

Temporary accommodation

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Network design				

Temporary accommodation

- Shelter sites
- Location decisions based on
  - Infrastructure
  - Accessibility
- Services required: electricity, clean water, drainage…
- Location of support facilities to serve shelters
  - Distribution points
  - Depots
  - Temporary healthcare centers
- Inventory management
  - Shelf life of relief items
- Workforce management
  - Managers, healthcare teams, security…

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Capacitated facility location, scheduling

OR Problems in Phase 1

Donation management

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Network design				

Donation management

- In-kind donations
  - Collection
  - Processing
  - Storage
  - Distribution
- Location of related facilities for each operation
- Management of related workforce
- Supply type and amount depends on the donor
  - Donation pollution

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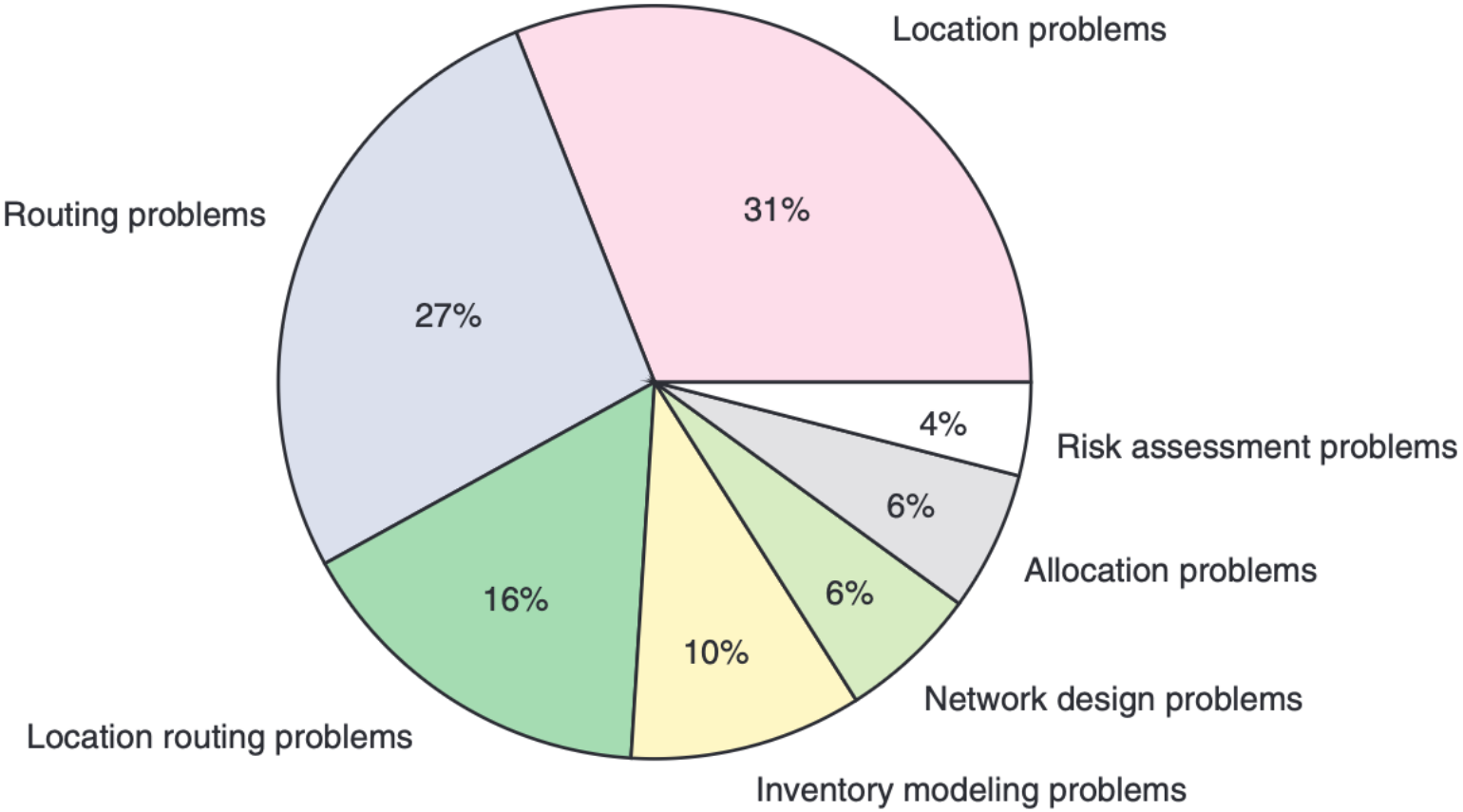
Resource allocation, VRP, scheduling

FIGURE 2. Distribution of OR problems in disaster management literature.



Source: Kara and Savaşer, 2017

Summary of Problem Characteristics

- High complexity
- High uncertainty
  - Dynamically changing environment
  - Information may not be available or reliable
- Timing is key for decisions and actions
- Multiple players, multiple perspectives, multiple objectives

Summary of Problem Characteristics

- Difficult (but very important!) to assess the potential impact and consequences of actions (short term and long term)
- Important to consider the human/social/behavioral component

- Interdisciplinary nature

- Lost of opportunities for utilizing OR / MS tools