Breakout Group A:

Spatial Criteria and Indicators

The 4 Habitat Slum Criteria

- Access to improved water
- Access to improved sanitation
- Access to secure tenure
- *Durability of housing*

- **Durable Housing: built in a non-hazardous location and has a permanent structure and is adequate enough to protect its inhabitants from the extremes of climatic conditions such as rain, heat, cold, humidity.**
- The following locations should be considered as hazardous:
  - Housing settled in geologically hazardous zones (landslide/earthquake and flood areas);
  - Housing settled on garbage-mountains;
  - Housing around high-industrial pollution areas;
  - Housing around other high-risk zones, e.g. railroads, airports, energy transmission lines.
- The following durability factors should be considered when categorizing housing units:
  - Quality of construction (e.g. materials used for wall, floor and roof);
  - Compliance with local building codes, standards and by-laws.

What Aspects of “Durability” can be Assessed Using RS?

Qualitative/Visual	Quantitative/Measurable
Proximity to hazardous factors: -industrial zones -rail roads -energy transmission lines -unstable slopes -flood plains -water courses & flash flooding -geological hazards -garbage mountains	Density vs. Lacunarity: -percentage area covered by structures -lack of open spaces -high ratio of roof to ground area -absence of vegetation
Road or street network: -haphazard -narrow -dirt vs. paved	Pattern different/distinct from prevalent urban pattern (they stand out): -textural contrast -consistency of orientation -morphology -building heights (derived from shadows or lidar)
Distance to services: -hospitals -railroad stations	Road or street: -haphazard -narrow -dirt vs. paved
Durability of housing/material for roofing: -corrugated tin -plastic sheeting/tarps -cloth/grass	Characteristic scale -relative size of housing units -relative size of road networks

Hybrid Approaches: Mixing Data

- GIS of infrastructure (health services, schools, electrical grids, roads)
- Census data for enumeration areas
- Survey of average inhabitants per dwelling/ density per unit area for different slum types within a city (tenement density) - use this to do population modeling
- Local knowledge from communities (including participatory mapping) or local government officials

RS Processing Approaches

- Scale of analysis will dictate the resolution of the RS data
- Use different RS processing methods to extract different indicators
  - Lacunarity
  - Texture
  - Orientation of buildings
  - Shadows for building heights
  - Vegetation indices
- Could do an overlay analysis to identify areas that meet all criteria for the 35 cities

Meeting UN-HABITAT's Needs

- Need to establish a methodology that cities themselves can take up to collect the primary data on slum inhabitants.
- Our approach needs to be SMART: Specific, Measurable, Available, Reliable, Time bound
- RS data to coincide with the intensive studies of the 35 sample cities.
  - The DHS data are GPS registered.
  - The surveys UN-HABITAT will be conducting will have lat-long for every household. (Confidentiality issues were raised.)

Country name	City Name or place
Egypt	Alexandria
Egypt	Shubra el Kheima
Morocco	Rabat
Morocco	Casablanca
Sudan	Khartoum
Cote d'Ivoire	Abidjan
Ethiopia	Addis Ababa
Ghana	Accra
Nigeria	Lagos
Senegal	Dakar
Argentina	Buenos Aires
Brazil	Sao Paolo
Mexico	Guadalajara
Mexico	Mexico
Venezuela	Caracas
China	Shanghai
China	Leshan
China	Guangzhou
China	Hong Kong SAR
Republic of Korea	Pusan
Bangladesh	Dhaka
India	Kolkota
India	Vijayawada
India	Mumbai
Uzbekistan	Tashkent
Indonesia	Jakarta
Myanmar	Yangon
Philippines	Metro Manila
Singapore	Singapore
Viet Nam	Ho Chi Minh City
Jordan	Amman
Lebanon	Beirut
Saudi Arabia	Tabuk
Syrian Arab Republic	Hama
Turkey	Istanbul

Early warning system

- Identifying informal settlements in their infancy.
- Need local knowledge to be able to identify patterns of early development.
- Will look different in Dhaka than in Cairo or Dar Es Salaam.
- If growth is via contagion, this area is potentially one that could become slum housing.

Case Studies

- Identify overlaps between Expert Group research areas and list of 35 cities
- Try to develop methods independent of costly software packages
- Involvement of local partners
- Validation of results by local authorities and NGOs