Development of An Early Warning and Automated Response System (EWARS) For Epidemic Prevention: A Case Study of Chikungunya In Kerala

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UNOOSA AT 6

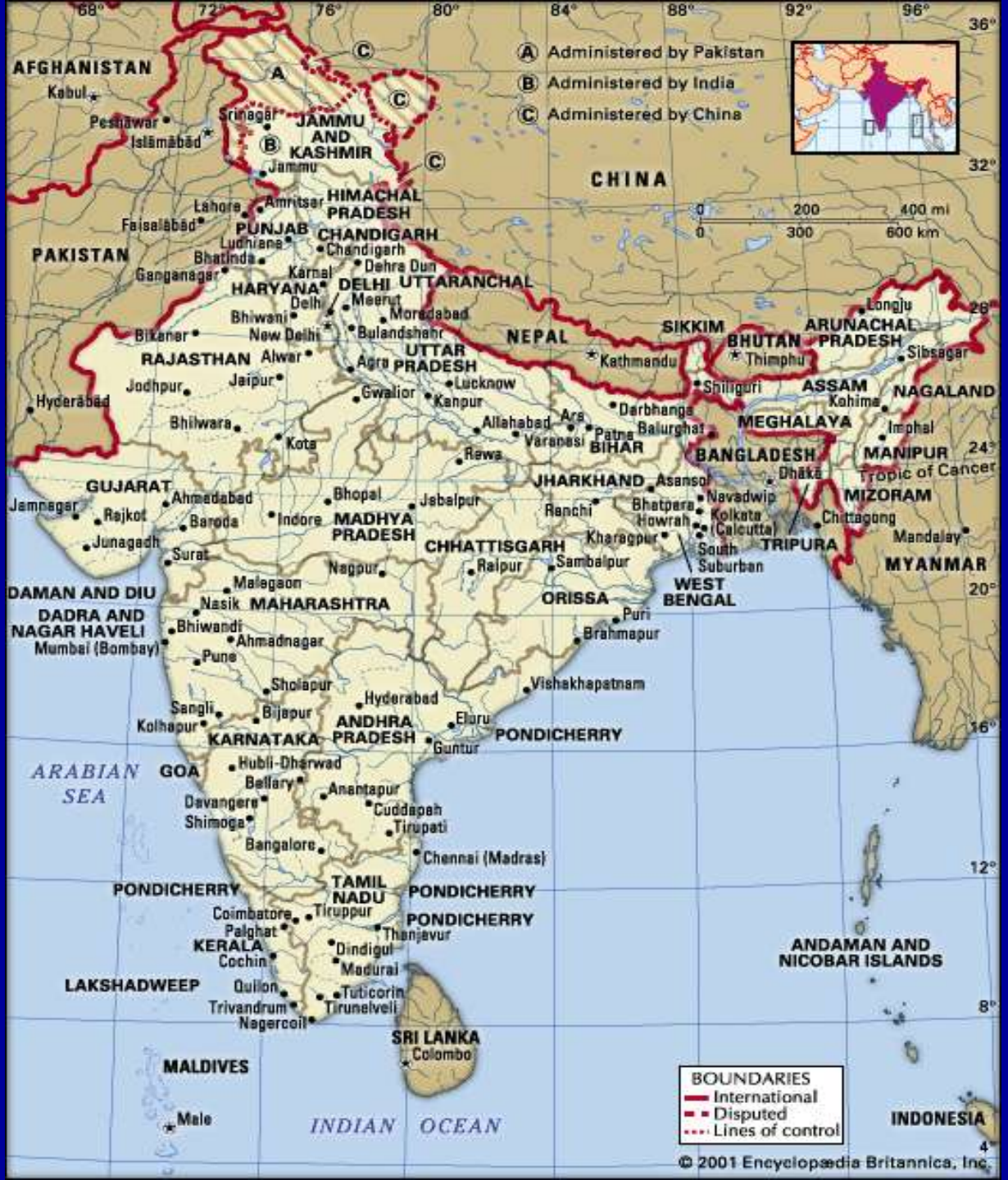
- “Improving Public Health through Space-based Technologies”
- Bangkok, August 2007
- Focus on HPAI
- Delegates were encouraged to collaborate on projects of mutual interest

Origins of the EWARS Project

- Desire for an action plan
- EWARS idea expanding on work being done by ReGlaN health logistics group led by Dr. Engelbert Niehaus, German delgate
- Decided to focus on Chikungunya infection in Kerala State, India
- Later addition of Malaria in SA

Chikungunya Facts

- Mosquito-borne alphavirus
- Transmitted by Aedes mosquito
- Incubation period of 2-4 days
- Fever, joint pains, rash
- Mortality rare
- Persistent joint pain and decreased level of function common
- Disease activity greatest June - October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Editorial

Is there hope for South Asia?

Yes, if we can replicate the models of Kerala and Sri Lanka

Two years turned the Indian subcontinent into South Asia. Between 14 August 1947 and 4 February 1948, India, Pakistan (its eastern part would later become Bangladesh), and Sri Lanka all gained independence from the

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Kerala Indices

- Life expectancy – 73+
- Infant mortality - 13
- More females than males
- Highest suicide rate in the country
- Highest morbidity rates in the country

Why is Kerala better?

- Enlightened leadership (particularly pre-independence) with an interest in public health
- Attention to immunization
- Higher levels of education
- Matriarchal society
- Greater hygiene
- More expectations from the public so generally elevated levels of healthcare

Current status

- Declining civic sense
- Increasing materialism
- Worsening pollution, congestion, sanitation
- “Lifestyle” diseases like DM, CAD on the rise
- Febrile illnesses rampant

The Team

- Germany: Engelbert Niehaus (MATH), Ruth Niehaus (MEDICINE), Gerhard Ackerman (LOGISTICS), David Niehaus (GRAPHICS), [Diana Schmidt (SOFTWARE)]
- India: Ajit Babu (MEDICINE, TELEHEALTH), [S. Sabesan (ENTOMOLOGY, GIS/REMOTE SENSING), P.G. Diwakar (REMOTE SENSING)]
- South Africa: Marlien Herselman (RURAL IT), [Maurice Mars (MEDICINE, TELEHEALTH), Chris Smith (E-HEALTH), Lynn Hammer (E-HEALTH)]
- United States: [Steven Kymes (COST-EFFECTIVENESS), James Stahl (OPERATIONS RESEARCH, T. Kesavadas (VISUAL REPRESENTATION OF DATA)]

RS + GIS

- Gives near real-time information on:
  - temperature
  - soil
  - elevation
  - patterns of land use
  - phases of vegetation
  - precise geographic location of water bodies, population centers, buildings, roads, and other infrastructure

Chikungunya EWARS

- Use RS and GIS data for Kerala
- Validation with ground truth
- Examine correlation of RS/GIS to ground truth
- Identify RS predictors for early warning
- Fuzzy logic system to facilitate resource allocation matched to database of existing resources
- Use RS/GIS to evaluate adequacy of response

Advantages of EWARS

- Minimal additional investments or changes to existing public health structure
- Real-time information
- Potential for substantial improvements in public health
- Expandable to other diseases

Challenges

- Support from the government
- Buy-in from local stakeholders
- Funding for sustainability
- Building wider collaborations
- Maintaining data integrity

Progress to Date

- Three meetings – Nov 07 (India), April 08 (Germany), August 08 (SA)
- Kerala government has agreed to pilot
- Pilot sites identified in SA
- Detailed project plan in progress
- Programming commenced

Open MRS
Ground data.
Proprietary
MRS

Funding → NGOs ?
→ KISC ?
→ Ind/SA - DST
→ IBSA ?

Travel | Dupt | Implement Pilot | Full Implementation

Prototype

Test bed

Timeline - Funds 0 - 12 mths | Prototyp dupt 0 - 6 mths Refinement - 6-12 | Impl 12 - 24 mths? → Kerala → SA

Collaborators/ Stakeholders

India
- Kerala DST + govt
- ICMR
- ISRO
- Ajit + CDH

Germany
- ?FP7
- Diana
- Gerhard
- David
- Ruth
- Bert + RegLand

SA
- CSIR - chris
- MRC - Lynn & Chris Seebregts
- TUT - M&D studi
- Marlien
- NRF
- DST
- Dept of Health(?)
- Rural Communities
- UKZN - Mars

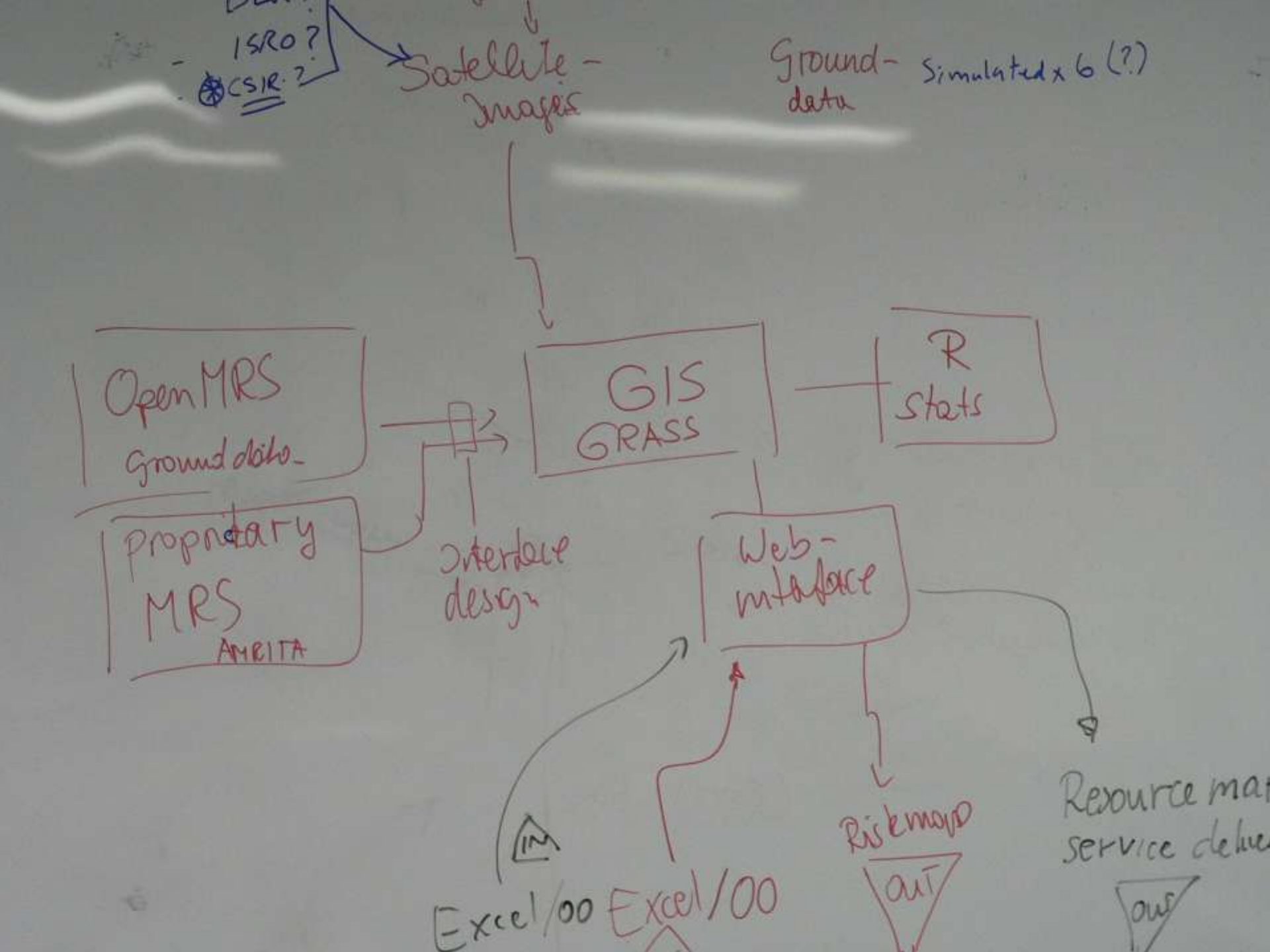
other
- ? Kesh - US

Meeting dates

Jan 09 12-20	INDIA	- ALL
Feb 2nd 09	AUSTRIA	- AJIT
Jun 09 1 - 7	GERMANY	- ALL
oct 09 1 - 10	SA	- ALL

How ? → Cleaning / Immunization / Spraying/Eradication

Training -
Locals - Education
Maintenance
Horticultural/fisheries?
Sanitation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Next Steps

- Meeting with Kerala government (Nov)
- Development of prototype (Ongoing)
- Next group meeting in India (Jan 09)
- Coalition building (Ongoing)
- Commencement of pilot (? July 09)

Conclusion

- EWARS offers the possibility of a common-sense approach to epidemic prevention that can be generalized to a variety of diseases and settings
- Pilot data from a real-world setting will be critical for further progress
- Collaborations are highly welcome