A. Findings from site visits and consultations with MRC programmes

B. Draft outline of revised discharge and sediment monitoring plan

Iwona Conlan

Discharge & sediment data needs of MRC Programmes

- Accurate stage-discharge rating curves for flood forecasting
- Predicting consequences of development scenarios
  - Basin Development Planning (BDP)
  - Decision Support Framework (DSF)
  - Hydrological, hydraulic and sediment transport modelling (TSD)
- Hydraulic parameters and sediment data for fisheries management and research
- Bed load data and tools for estimating reservoir sedimentation rates
- Sediment transport and channel morphology data for predicting effectiveness of:
  - Navigation channel dredging/maintenance projects
  - Bank protection works

Data needs for sediment transport modelling

- Accurate cross-section data
- Observed cross-section profile changes (for model calibration)
- Bed load estimates
- Suspended sediment grain-size
- Bed-material grain size
  - Existing data from one survey in 2005
  - Sampling every 100-150 km
- Tributary sediment input data

Developing sediment transport models
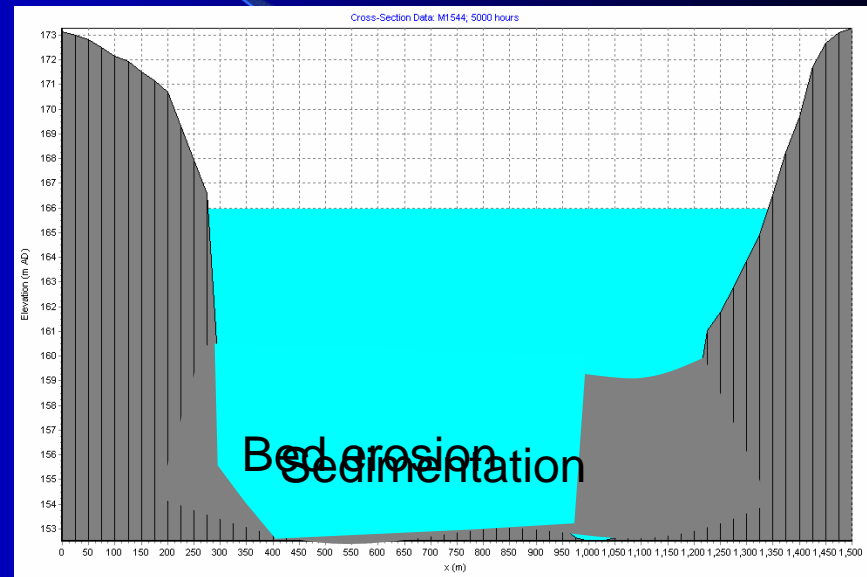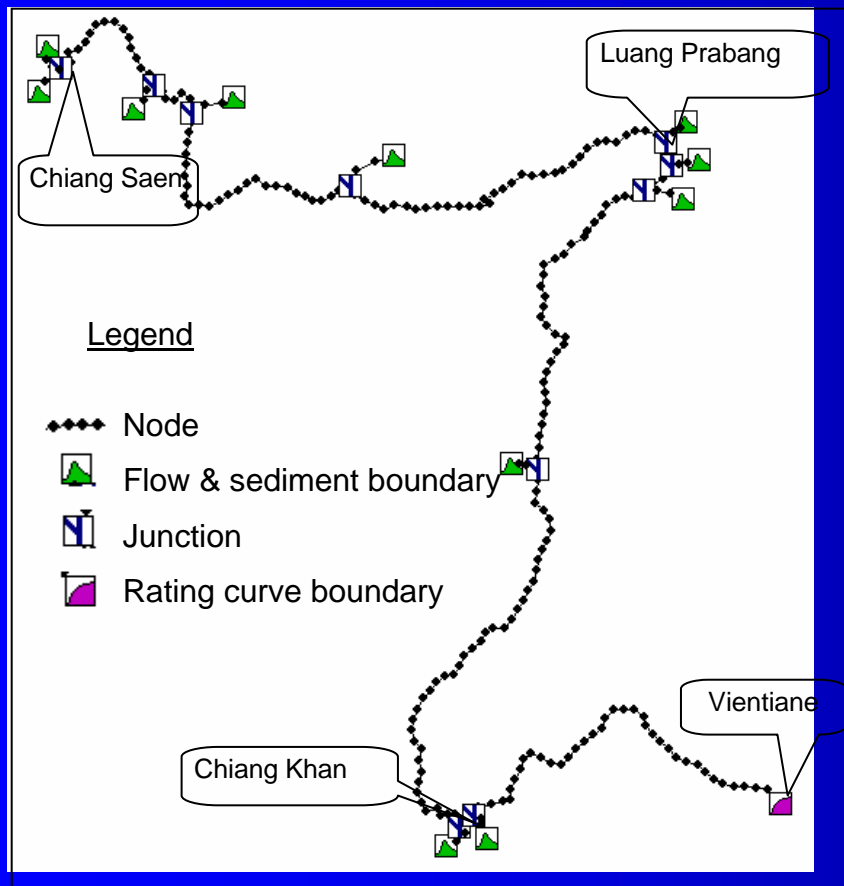
Priority locations for collecting sediment and channel morphology data

- Model boundaries
  - 1-D basin model – e.g. Chiang Saen, tributary junctions
- Ecologically sensitive areas
- Populated areas
- Near planned hydropower dam sites
- Locations important for navigation, bank erosion etc. (e.g. Huay Xai, Tan Chao)

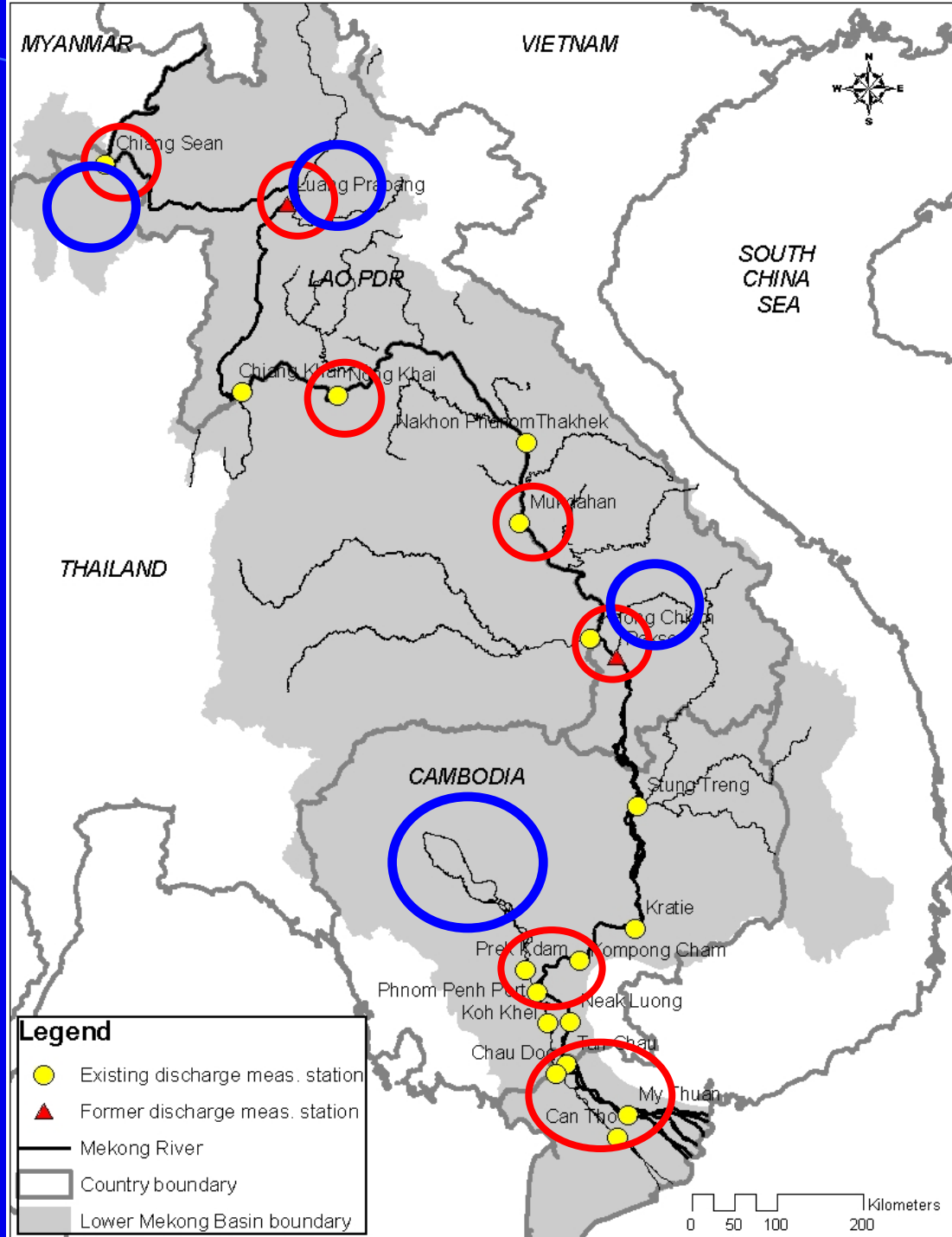# Findings from site visits

Site Visits

August – October, 2008

12 mainstream stations visited

+

Tributary stations in Thailand, Laos and Cambodia

Key issues for discharge measurements

- Several boats and engines are not in working order or too small for wet season conditions
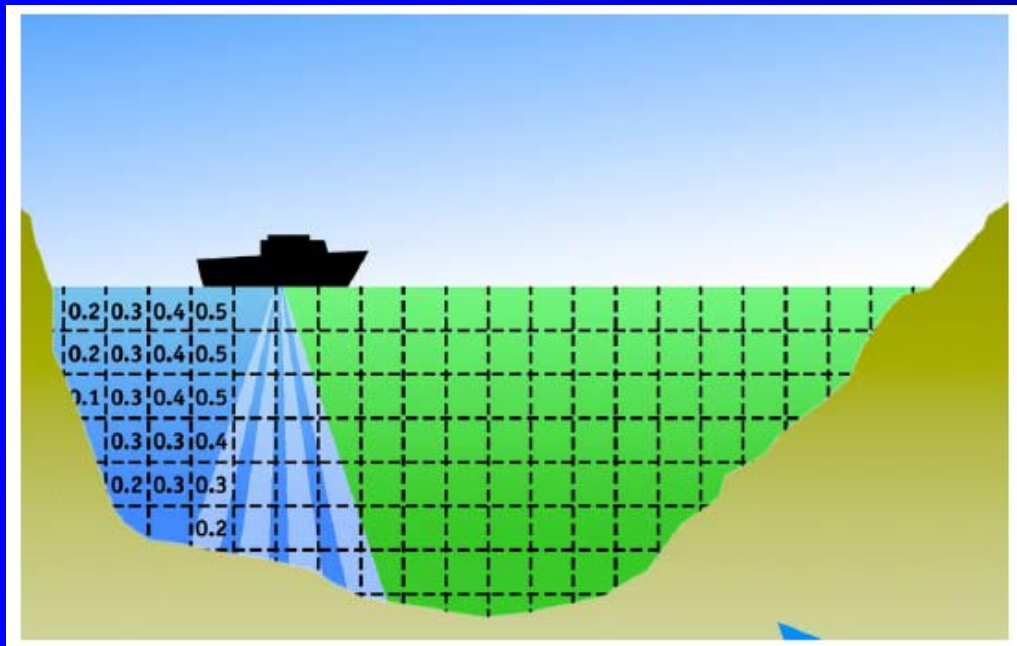
Equipment needs repair & maintenance

– Winches

– Current meter counters

– Depth sounders

Current meters need to be calibrated

# Issues with discharge measurement by ADCP

Issues with discharge measurement by ADCP

ADCP is used at Nong Khai, all Cambodian stations, 4 stations in Vietnam (5 instruments in total)

- Moving bed conditions are causing discharge measurements to be biased low (underestimated) ~ 5 − 25 %

- This has huge consequences for flood forecasting, flood frequency and magnitude calculations, modelling, assessing historical flow trends etc.

Moving bed effects -need for Differential GPS

Ship Track
— Ref:Btm — Ref:GGA

Q_{BT} = 30 429 m3/s

Difference

= 9 000 m3/s !!

Q_{GPS} = 39 815 m3/s
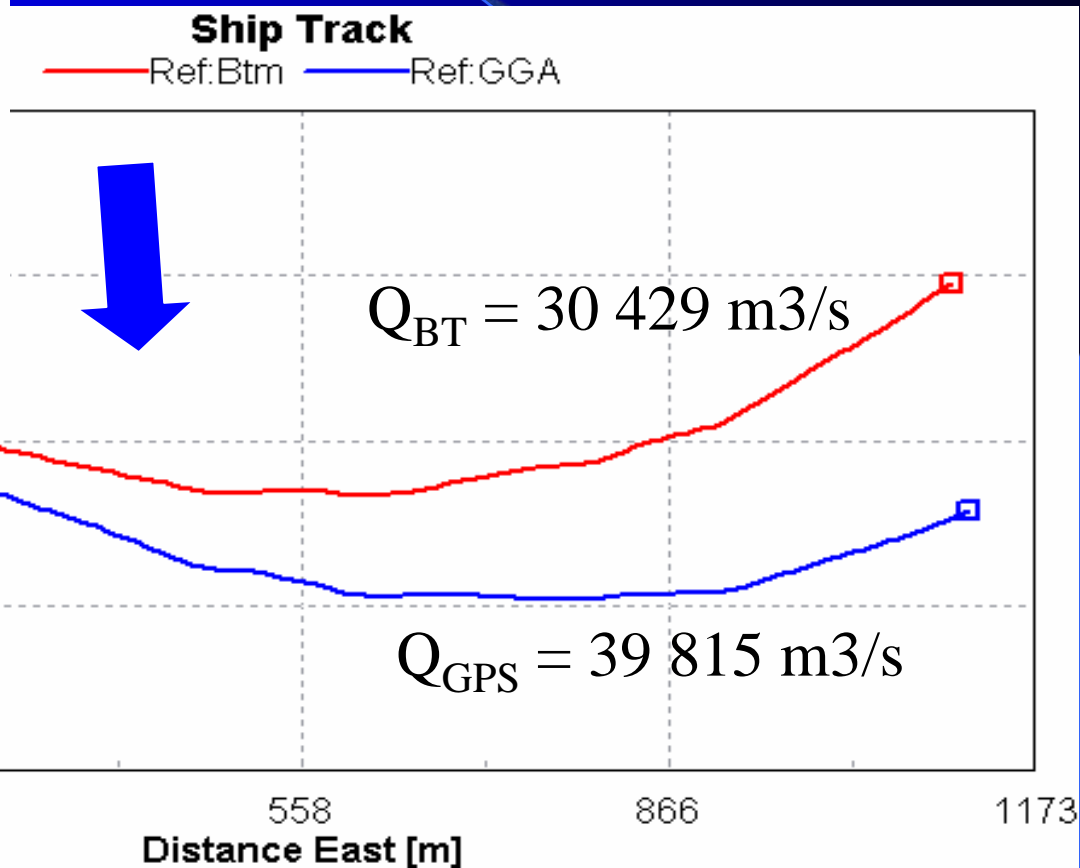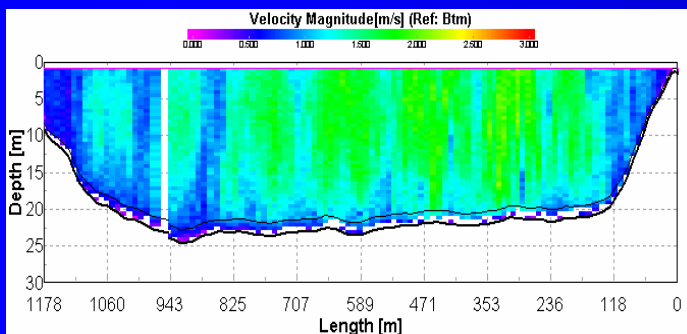
Mekong River @ Kampong Cham – 17/9/08

Issues with ADCP cont…

- **Instruments are 6-8 years old**
  - Need calibration & maintenance
  - Several have faulty cables or problems with the ADCP itself
  - Need repair or replacement
- **Need for refresher training on ADCP**
  - Operation
  - Simple maintenance & trouble shooting
  - Data quality checking

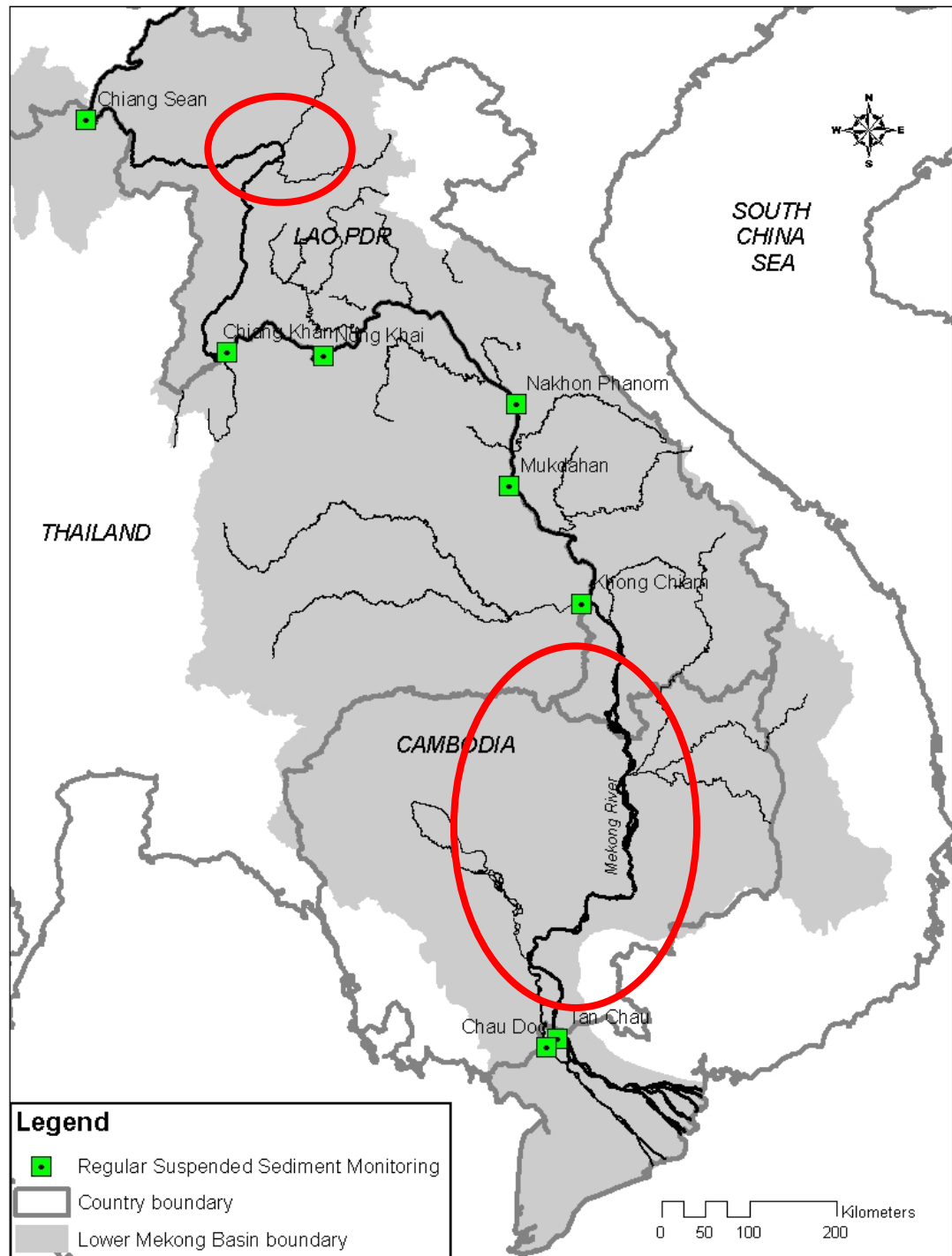# Existing suspended sediment monitoring stations

Thailand – continuously since 1999

Vietnam – started in 2008

Wet season – weekly

Dry season –

2-3 times /month

Legend

- Regular Suspended Sediment Monitoring
- Country boundary
- Lower Mekong Basin boundary
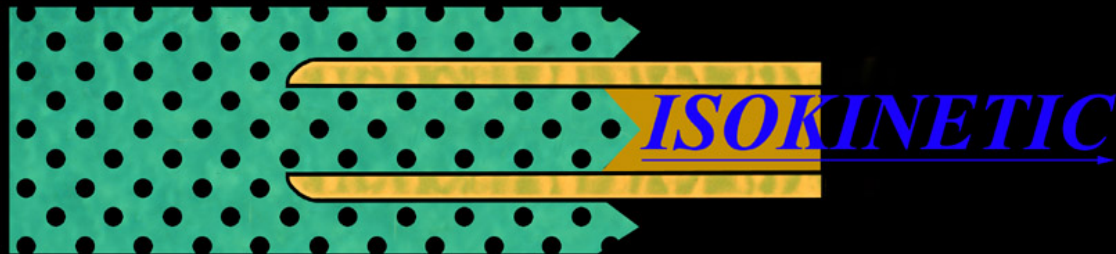
Issues with sediment sampling

- Existing US D-49 samplers are not suitable for depths > 4.5m (Mekong stations ~ 15m deep)
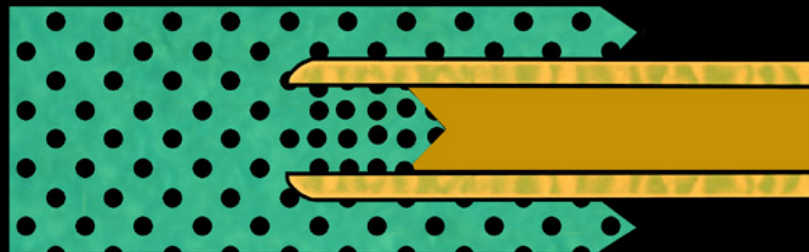- Hand-made samplers at some stations are not isokinetic

Why isokinetic?
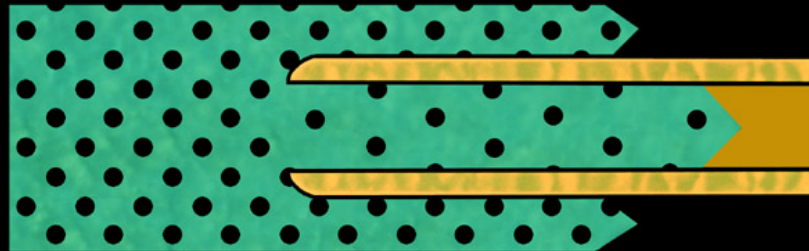
Sample transfer

Final sample container
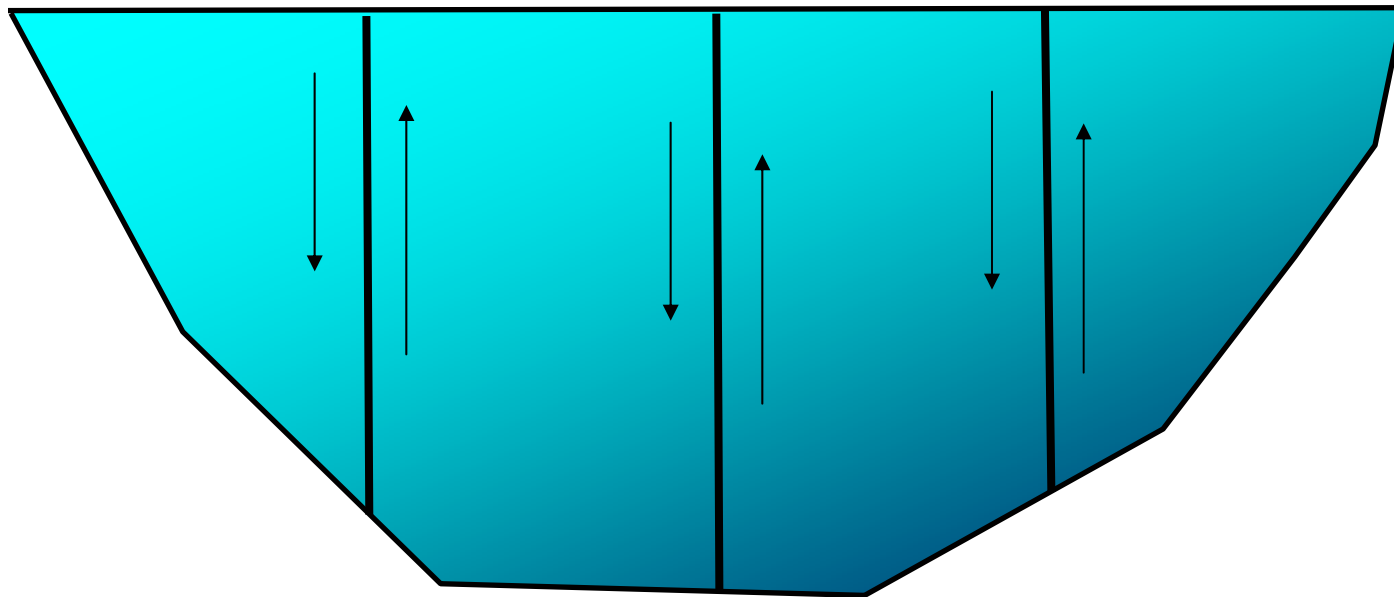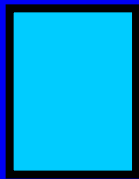
Draft monitoring plan

(Your comments are welcome)

Phase 1 - 2009

- Sediment data sharing agreements established with countries

- Suspended sediment sampling equipment purchased and sampling established at all existing stations

- Training provided on sediment sampling techniques

- Pilot bed load measurements made at 2-3 stations

- Selected SS samples are sent off for grain-size analysis

- Winches purchased for stations without one (Cambodia)

- Sediment labs established in Lao PDR

- Training is provided to lab staff on standard analysis technique for SSC

Phase 1 continued…

- Essential repairs to boats & engines are made

- Essential repairs to current meters, depth sounders, ADCPs

- Address moving bed issue for stations where ADCP is being used

  – Purchase Differential GPS

  – Provide training on Loop Correction Method

- Cross-section profiles and surveys of velocity and flow patterns made near planned mainstream dam sites

Where?

1. Existing mainstream gauging stations

2. Important tributary stations
   (e.g. Laos & Cambodia)

3. Near planned mainstream dams

Legend
- ● Existing discharge meas. station
- ▲ Former discharge meas. station
- — Mekong River
- Country boundary
- Lower Mekong Basin boundary
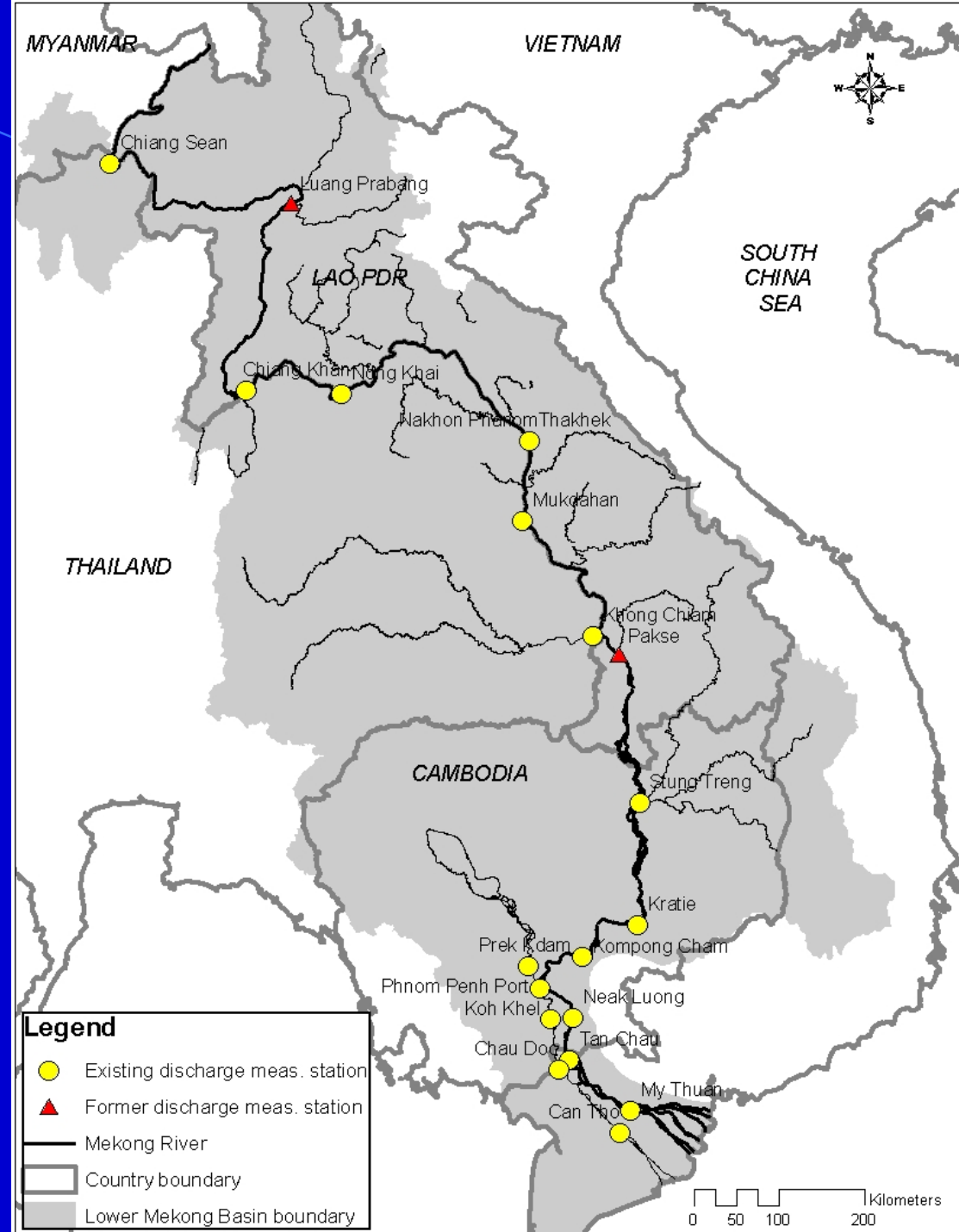
Outputs of Phase 1

- Sediment monitoring network is established
- The most urgent data quality issues are addressed
- Initial training is provided
- Essential data for urgent modelling is acquired
  - Existing sediment data
  - Bed load data
  - Suspended sediment grain-size data
  - Channel cross-sections

Phase 2: 2010

- All stations upgrade to use ADCP for discharge measurements
- Differential GPS system set up near each station
- Comprehensive training on ADCP operation, maintenance & data quality checks
- All boats and engines are fully refurbished
- Bed load measurements extended to more stations

Key technical questions for next session

- What type of suspended sediment samplers are most appropriate?
  - Depth-integrated
  - Point-integrated
- Do we need surrogate measurements of suspended sediment ?
- What is the best method of measuring bed load?
  - Dune tracking studies
  - ADCP bottom-tracking