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RÉPUBLIQUE FRANÇAISE

DGTPE
Direction générale du Trésor
et de la Politique économique

Sustainable Rural Electrification Plans

and practical investment case studies

Inception Workshop
Phnom Penh 4-5 March 2010

SREP

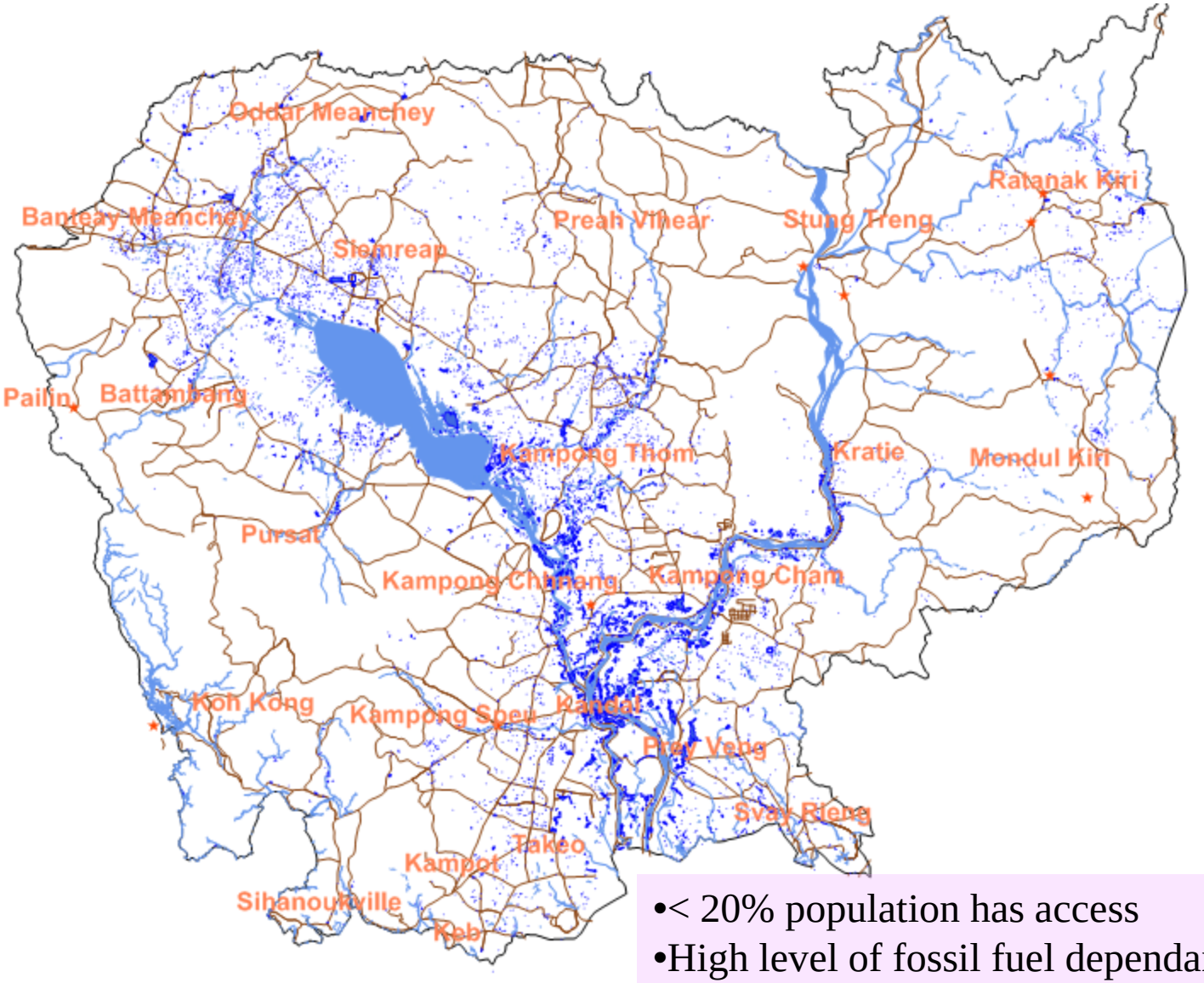
IED

GeoSim

CDEC CAMBODIA DEVELOPMENT ENGINEERING CONSULTING

Contents of the presentation

- SREP study context and objectives
- Presentation of the team and project organisation
- Overview of methodology and activities
- Key Milestones



- < 20% population has access
- High level of fossil fuel dependance
- Expanding imports from VN and Th
- Role of over 200 REEs complementing EDC

SREP Objectives

- Produce sustainable rural electrification investment plans, as a tool for investment planning and policy dialogue for MIME
  - Province by Province
  - Using the IED developed decision aid tool GEOSIM
  - Options: grid extension, local, renewable energy resources, diesel
  - Various scenarios : policy objectives (eg connection rates, within a certain time frame) and constraints (eg budgetary)

- Know-how transfer: install the GEOSIM software at the Ministry and train MIME staff

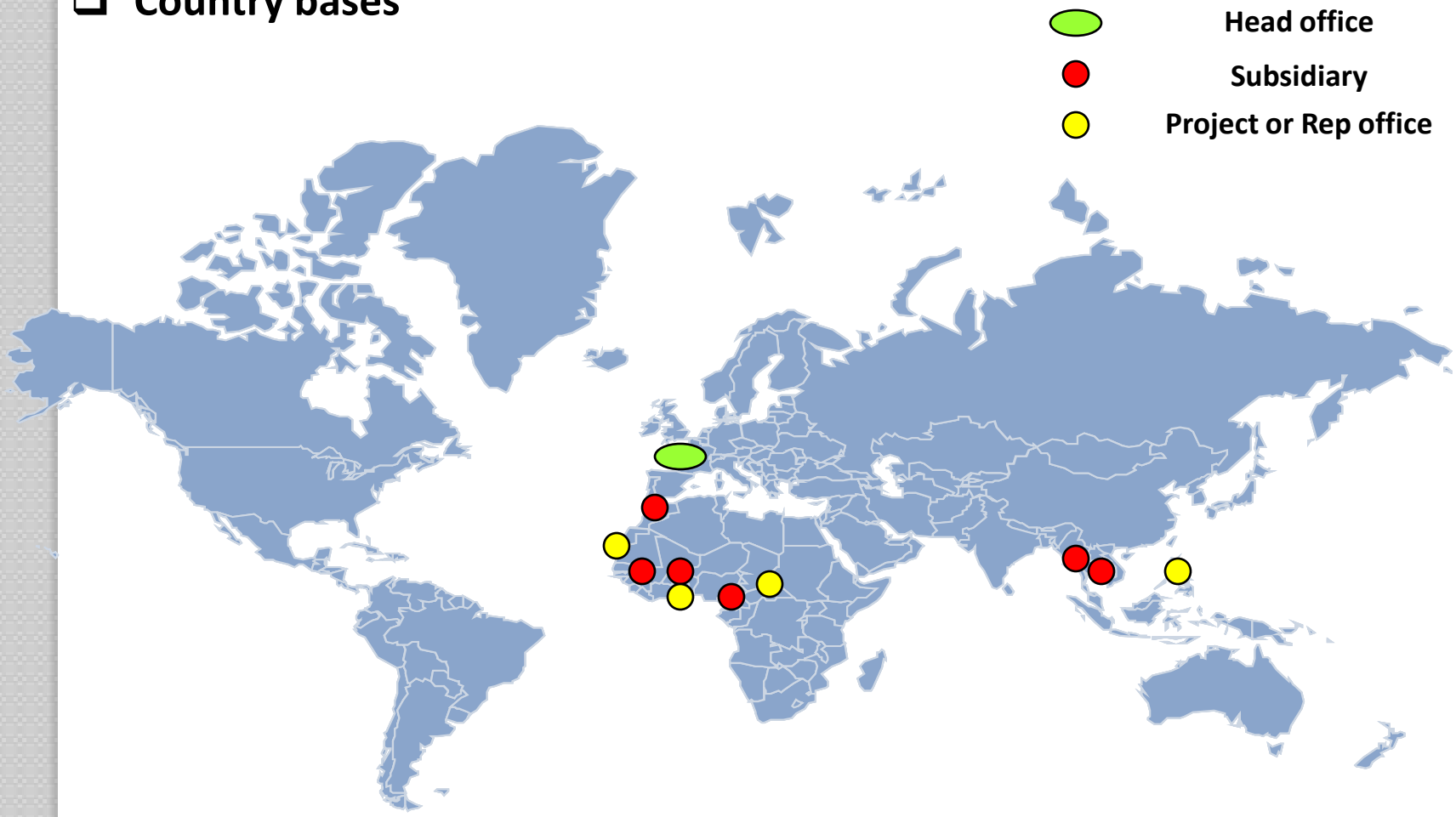
- Feasibility studies for 2 to 5 potential renewable energy projects (50kW-2MW)
  - Develop business models
  - Mobilise operators and financial partners
  - Involvement of REF (fiancing) EAC (regulatory framework) EDC (network)

Project partnership

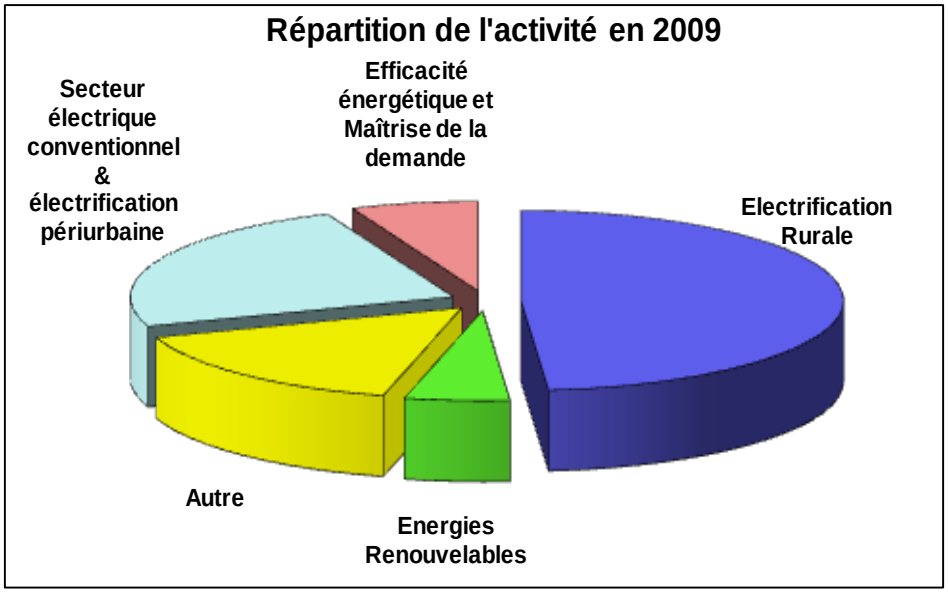
- Based on a request from MIME, the French government has provided financial support through the FASEP fund of the Ministry of Finance;
- The French Engineering and Consulting firm, Innovation Energie Développement (IED) based in Lyon has been contracted
  - In partnership with CDEC (Cambodia Development Engineering Consulting) – subsidiary in Cambodia
  - Subcontracting CFG services to assess the potential for low temperature geothermal energy
- MIME – the beneficiary
  - Contributes to defining the planning scenarios
  - Ensures data collection
  - Mobilises the needed Consultative Group of :
    - Energy sector operators : EDC, EAC, REF, REEs
    - Relevant Ministries: health, rural development, agriculture, …

IED in brief

- 40 employees staff, 10 nationalities
- 50% based outside France
- Country bases



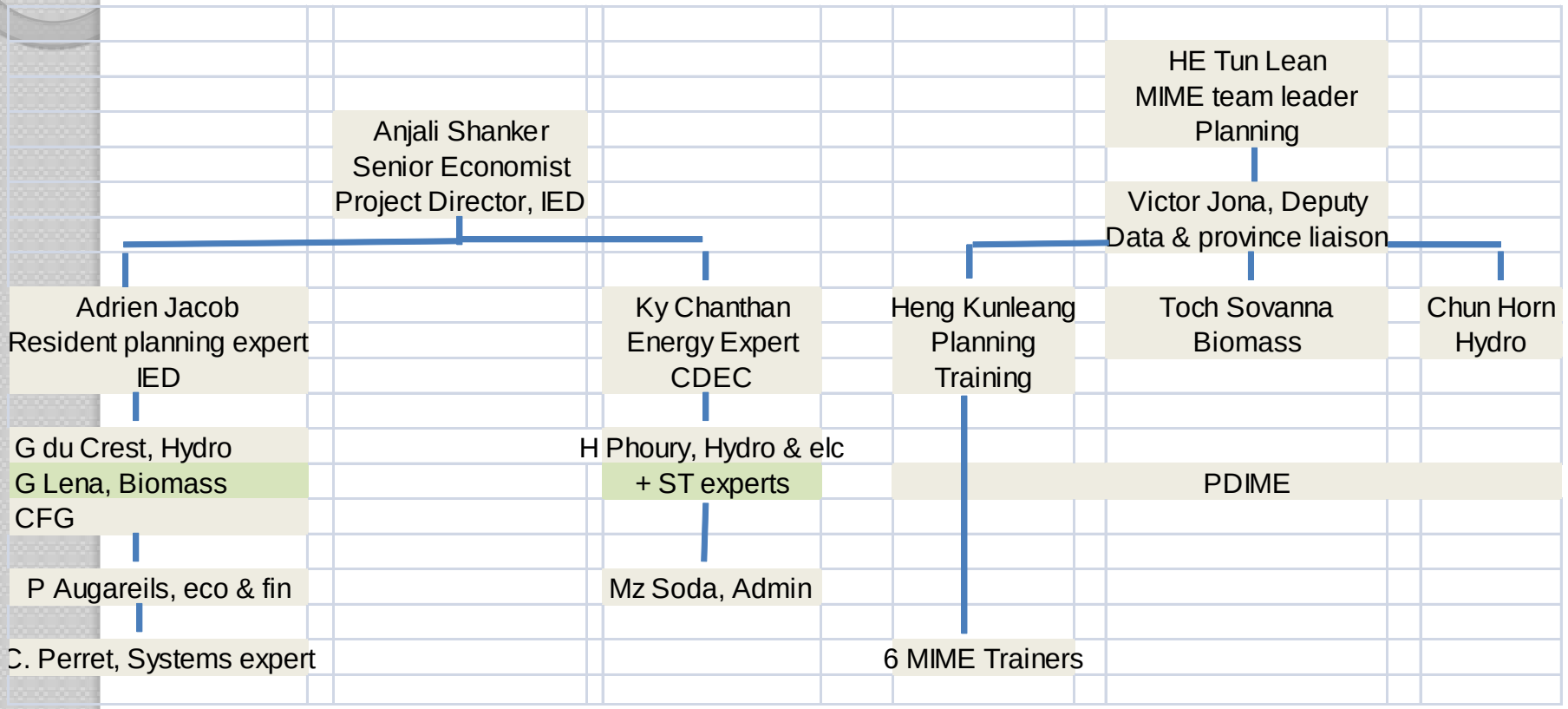
- Centered on access to electricity services in rural and periurban areas
- Focussed on sustainable development: renewable enrgy, energy efficiency, capacity strengthening
- From policy formulation to hands on project implementation



In Cambodia since 2003,

- Capacity building in the power sector – regional interconnections to bring down cost of service
- Capacity building for rural electrification: technical and financial management for rural entrepreneurs
- Planning, with the setting up of a national data base – CAP REDEO pilot in Kampong Cham
- Energy efficiency in the hotel industry

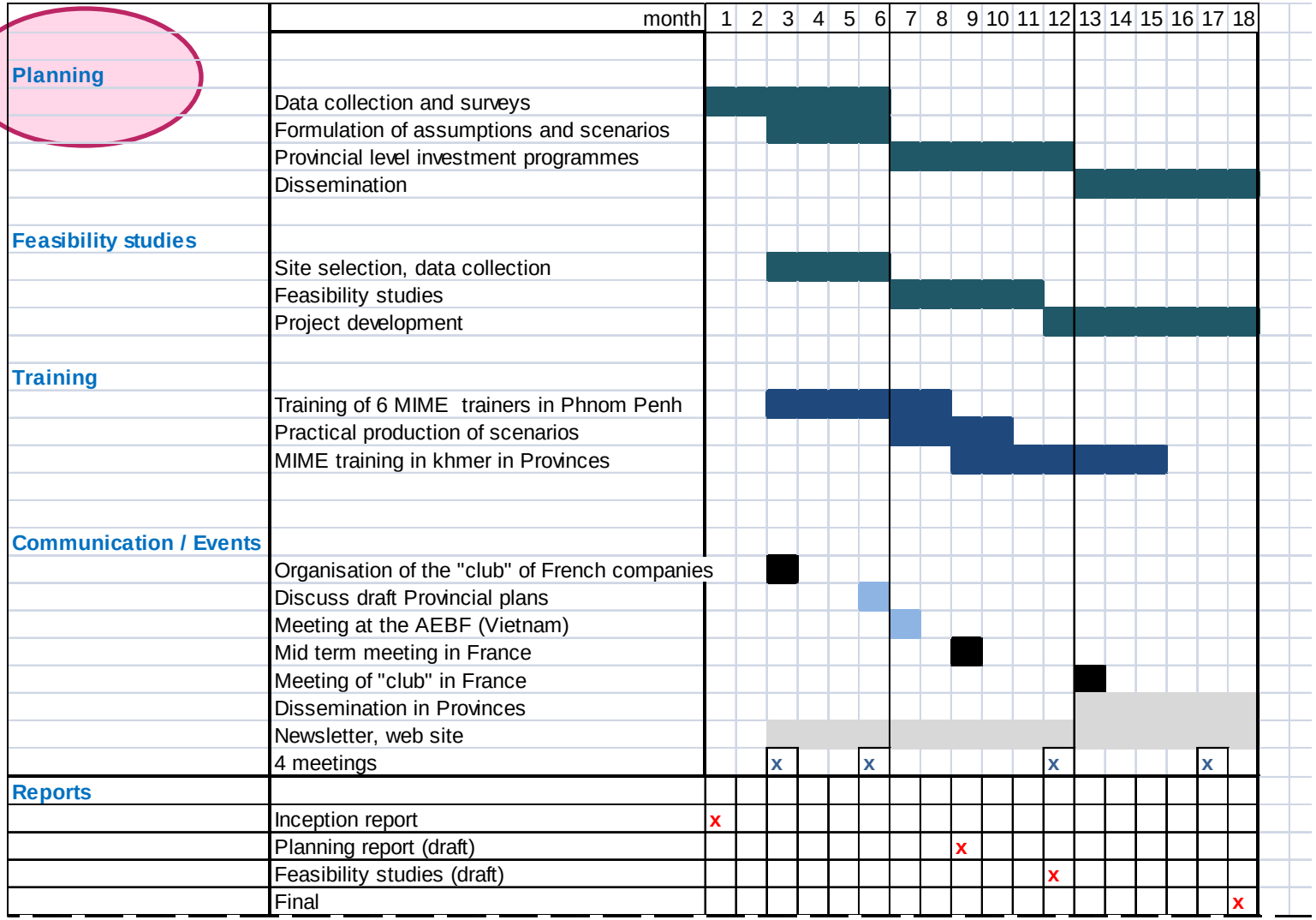
Project team and responsibilities



Overview of activities and approach

- The planning approach
- Data collection and scenario formulation
- Training
- Feasibility studies
- Mobilisation of partners

Summary schedule



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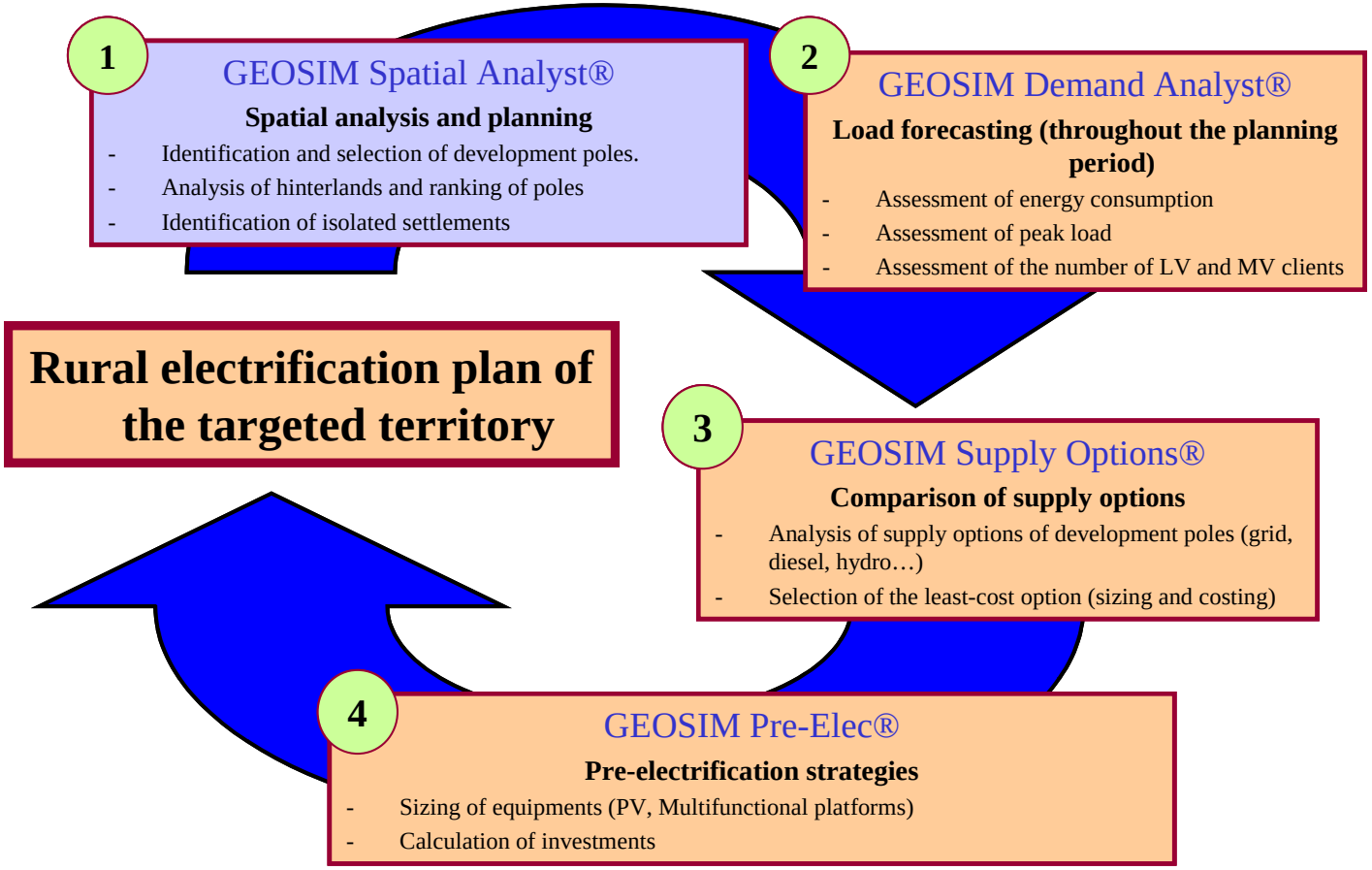
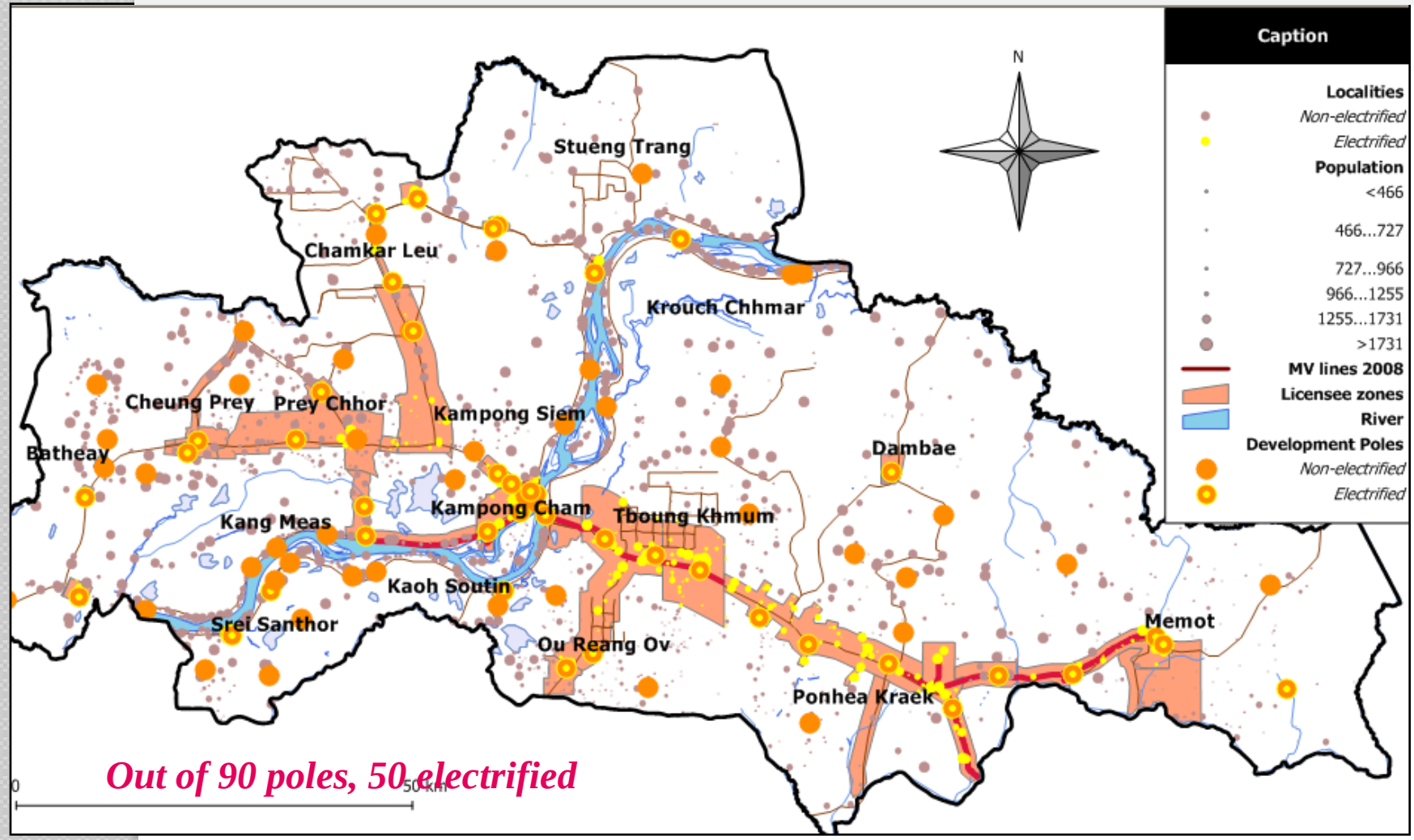
	Final																		x

GEOSIM planning process – overview – illustrate from Kampong Cham example



Status of electrification, plans, "off grid" areas (example of Kampong Cham)



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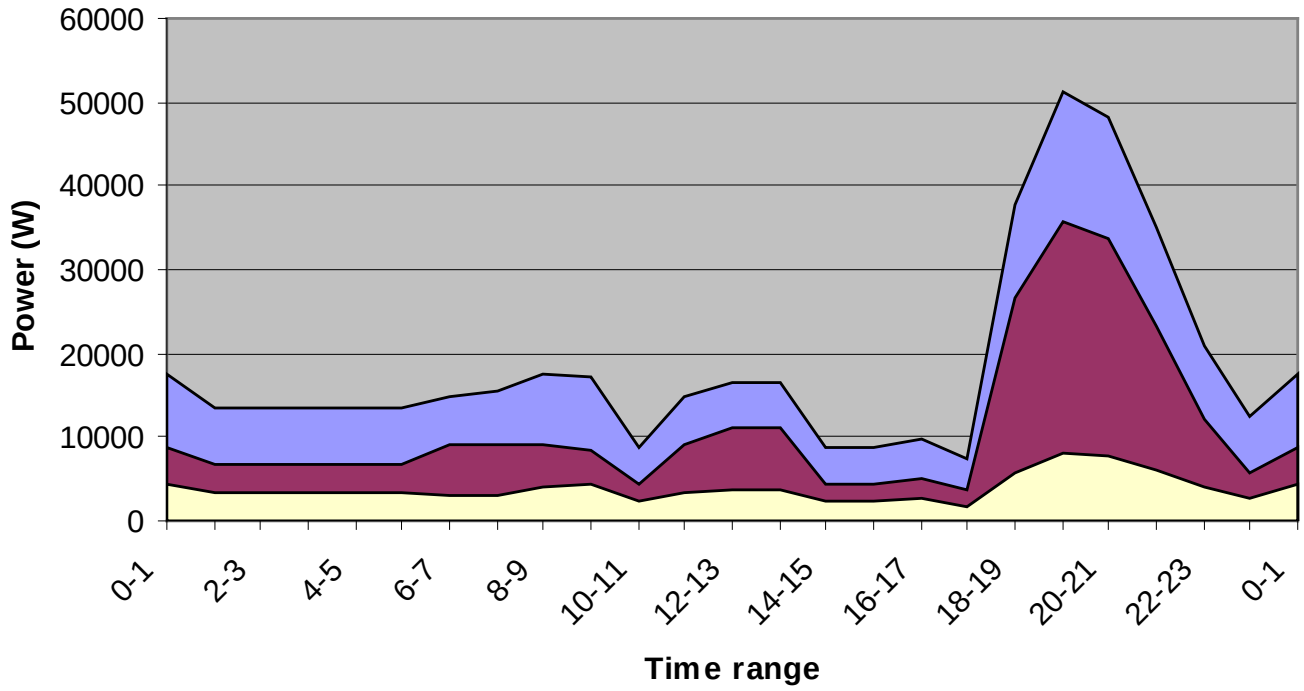
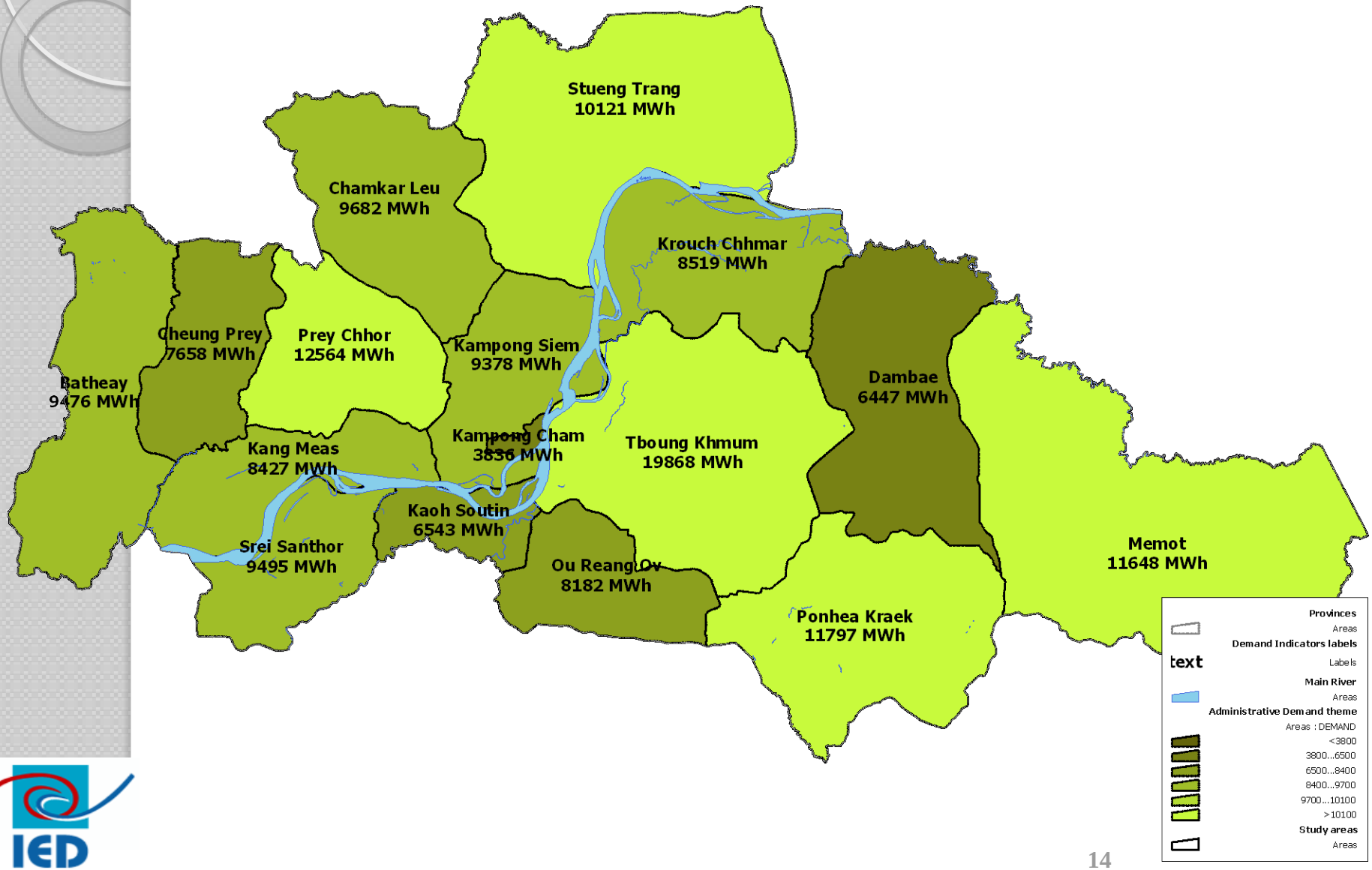
Typical village daily load curves for the 1st , 10th and 20th year (without technical losses)



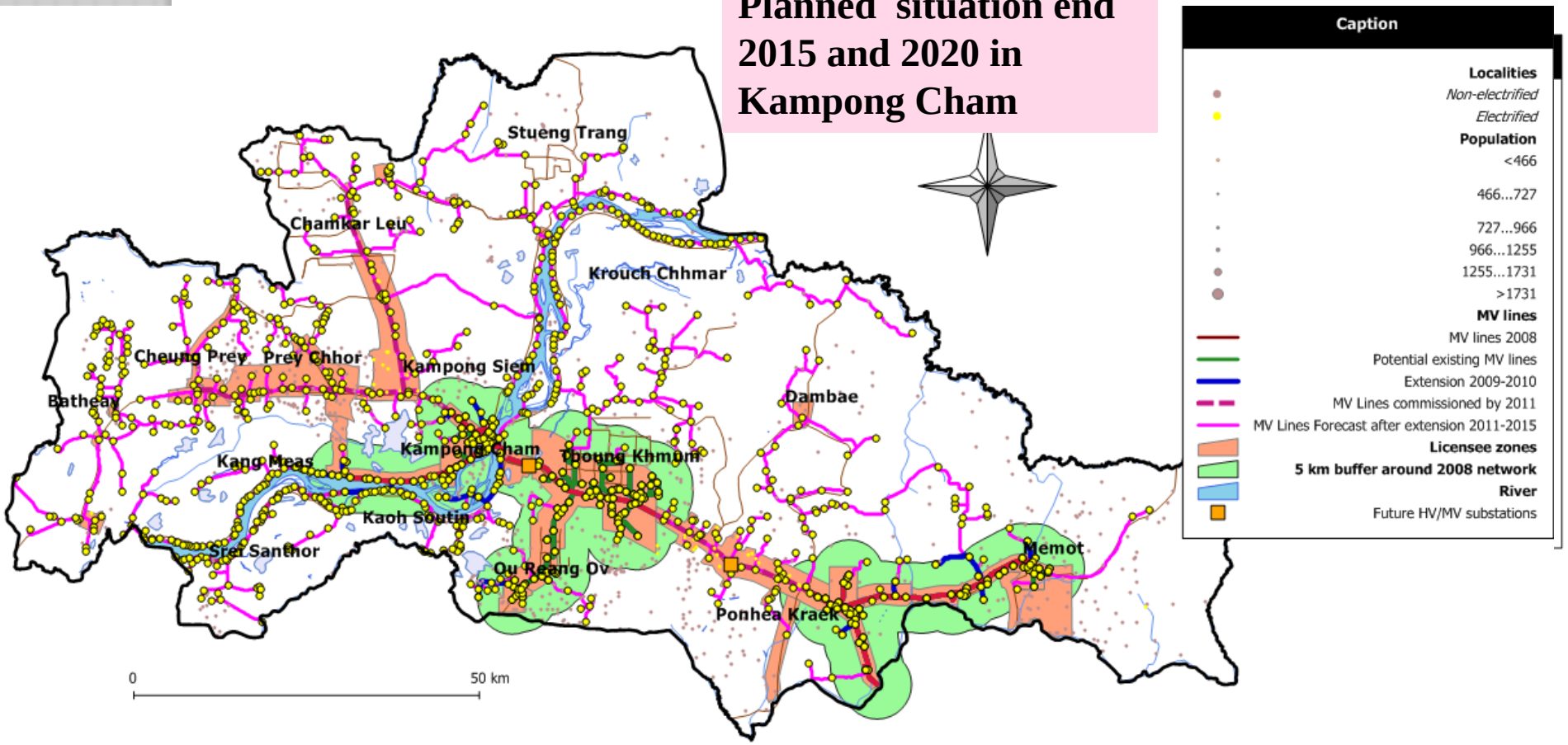
Load Forecast – *2009 demand by district*



Output example for 100% grid extension scenario

Current status

Planned situation end 2015 and 2020 in Kampong Cham



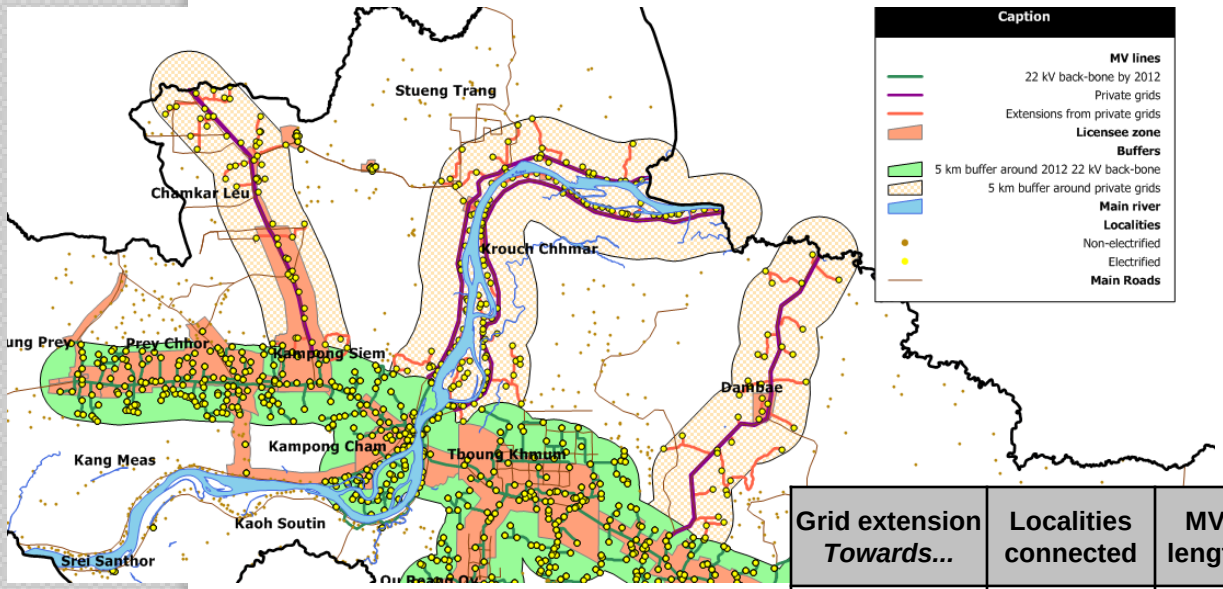
Results example for Kampong Cham 100% grid extension

	Pop 2009 '000	Villages connected	dem 2009 kWh/cap	MV line length km	km/village	cost per village $	cost per HH	Invest for Trans (M$)	Invest for Dist (M$)
2008 to 2010	284	219	76	201	1,5	50 000	219	4,8	6,2
2012 to 2016	1 113	770	75	1 317	1,7	97 000	382	32	43
2016 to 2020	448	770	80	1 071	1,4	63 000	612	26	22
total	1 845	1 759	76	2 589	1,5	76 000	413	62	72

Total investment: 134 M$

Results example for 3 private line extensions

- All villages connected within 5 km buffers



Grid extension *Towards...*	Localities connected	MV lines length (km)	Population 2009	Power demand 2009 GWh	Km / village	Cost / HH
Chamkar Leu	62	84	83 028	6,3	1,3	362,7
Stueng Trang	142	165	185 335	13,9	1,2	348,9
Dambae	37	86	38 841	3,0	2,3	541,6
TOTAL	**241**	**335**	**307 204**	**23,1**	**1,4**	**377,0**

Grid extension *Towards...*	Investment for transmission (MUS$)	Investment for distribution (MUS$)	Total investment (MUS$)
Chamkar Leu	2,0	3,3	**5,3**
Stueng Trang	4,0	7,4	**11,3**
Dambae	2,1	1,6	**3,7**
TOTAL	**8,0**	**12,3**	**20,3**

Key issue: how to attract private investors into this?

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For remaining villages

- Hydro & biomass generation
  - Supplying a cluster of villages
- Diesel supplied mini grids
- Isolated areas : off grid distributed individual (SHS and pico hydro)

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Example of reports produced by GEOSIM

28/05/2008

BIOMASS PROJECTS REPORT

AREA : Kampong Cham

Cluster # :	1	Levelized cluster cost :	0.26	$ US/kWh
		Levelized connected cluster cost :	0,16	$ US/kWh

Settlement Name	Population
Kandal	466
sambuor	963
Kor	1 227

Total population Cluster : 1 2 656

Cluster # :	2	Levelized cluster cost :	0.34	$ US/kWh
		Levelized connected cluster cost :	NA	$ US/kWh

Settlement Name	Population
Beak Anlung	2 656

Example of reports produced by GEOSIM

Supply Options module

Cashflow Report for Hydro Projects

Mode : Isolated

Project # 1 | Pole name : Srae Sangkae | Area : Kampong Cham | Levelized Cost : 0.41 $ US/kWh | Settlements number in the cluster : 1

SHP Capacity : 4 *kW* | Hydro residual value : 7 600

Residual Values				50 587	
Transformers	LV lines	MV lines	Genset	Power House	Grid connection
4 800	1 260	25 356	2 571	9 000	0

Year					Cluster investments				Cluster O&M	
		Genset energy produced :	0	*kWh*	Small Hydro :	6 000	Meters MV :	0	O&M Fuel :	0
		Hydro energy produced	0	*kWh*	Genset :	0	Meters LV :	0	O&M Maintenance :	0
		Demand	22103	*kWh*	MV lines :	21 000	Transformers LV :	4 000	O&M Personnel :	0
		Peak	4	*kW*	MV internal lines :	130	Transformers MV :	4 000	O&M Others :	0
		Customers LV :	14		LV lines :	975	Grid connection :	0	**Total O&M :**	**0**
		Customers MV :	2		Power house :	15 000	**Total Investments :**	**51 105**		
		MV length :	1750	*m*						
Year	2	Genset energy produced :	1762	*kWh*	**Cluster investments**				**Cluster O&M**	
		Hydro energy produced	24878	*kWh*	Small Hydro :	6 000	Meters MV :	10 000	O&M Fuel :	624
		Demand	26464	*kWh*	Genset :	5 600	Meters LV :	950	O&M Maintenance :	725
		Peak	5	*kW*	MV lines :	21 000	Transformers LV :	4 000	O&M Personnel :	240
		Customers LV :	19		MV internal lines :	130	Transformers MV :	4 000	O&M Others :	120
		Customers MV :	2		LV lines :	975	Grid connection :	0	**Total O&M :**	**1 709**
		MV length :	1750	*m*	Power house :	0	**Total Investments :**	**52 655**		
Year	3	Genset energy produced :	4823	*kWh*	**Cluster investments**				**Cluster O&M**	
		Hydro energy produced	26486	*kWh*	Small Hydro :	0	Meters MV :	0	O&M Fuel :	1 709
		Demand	30827	*kWh*	Genset :	0	Meters LV :	200	O&M Maintenance :	725
		Peak	7	*kW*	MV lines :	0	Transformers LV :	0	O&M Personnel :	240
		Customers LV :	23		MV internal lines :	0	Transformers MV :	0	O&M Others :	120
		Customers MV :	2		LV lines :	0	Grid connection :	0	**Total O&M :**	**2 794**
		MV length :	1750	*m*	Power house :	0	**Total Investments :**	**200**		

Overview of methodology (2)

- The planning approach : building on the results of the Cap REDEO pilot phase implemented in Kampong Cham Province
- **Training**
- **Data collection and discussion of scenarios**
- Feasibility studies
- Mobilisation of partners

Training of 6 MIME planners in PP

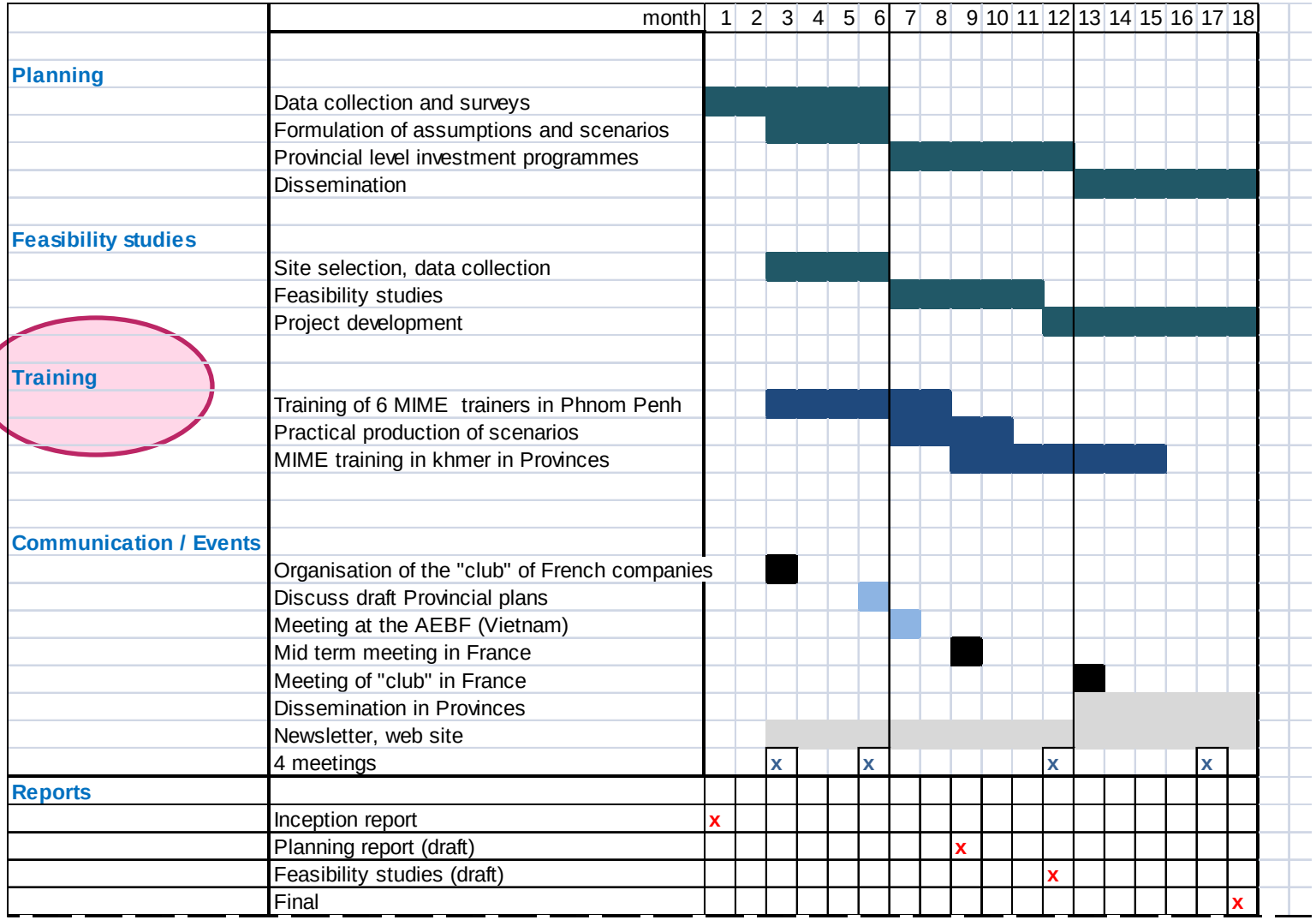
- **Global objective:** Trainers must be able to
  - Understand rural electrification concepts and issues
  - Master GIS basic techniques
  - Be familiar with GEOSIM© modules and be able to run scenarios at provincial level
  - Train in khmer on GIS techniques and GEOSIM use at regional level
- **Training session Agenda:**
  - Three training sessions will be conducted for the next 6 months (7 days each)
    - Overview, data base and GIS, Spatial analysis
    - Load forecast and grid extension
    - Renewable energy and off grid supply options
  - Each trainer will be evaluated at the end of the session and some tests will validate the acquired knowledge in order to prepare some assignments
  - Weekly follow up by resident planning expert
- **Further deployment:**
  - Training manuals will be provided in khmer and used by trainers
  - MIME will decide upon and organise training in khmer in key Provinces

Data collection and discussion of scenarios

1. Existing and planned networks and generation by EDC and REEs
2. Socio economic data to assess load growth and impacts
3. Potential hydro sites and biomass sites

- Already started with the support of MIME and will be discussed tomorrow
- Regional kick offs organised by MIME counterparts
  - Overall project presentation
  - Organisation of data collection with PDIMEs
  - At Provincial level and surveys
- Scenarios:
  - First discussion, this afternoon
  - Meetings with counterparts every 2 weeks
  - June 2010: presentation of results and discussion on further sensitivity analysis

Summary schedule



Overview of methodology (3)

- The planning approach : building on the results of the Cap REDEO pilot phase implemented in Kampong Cham Province
- Training
- Data collection and discussion of scenarios
- **Feasibility studies**
- **Mobilisation of partners**

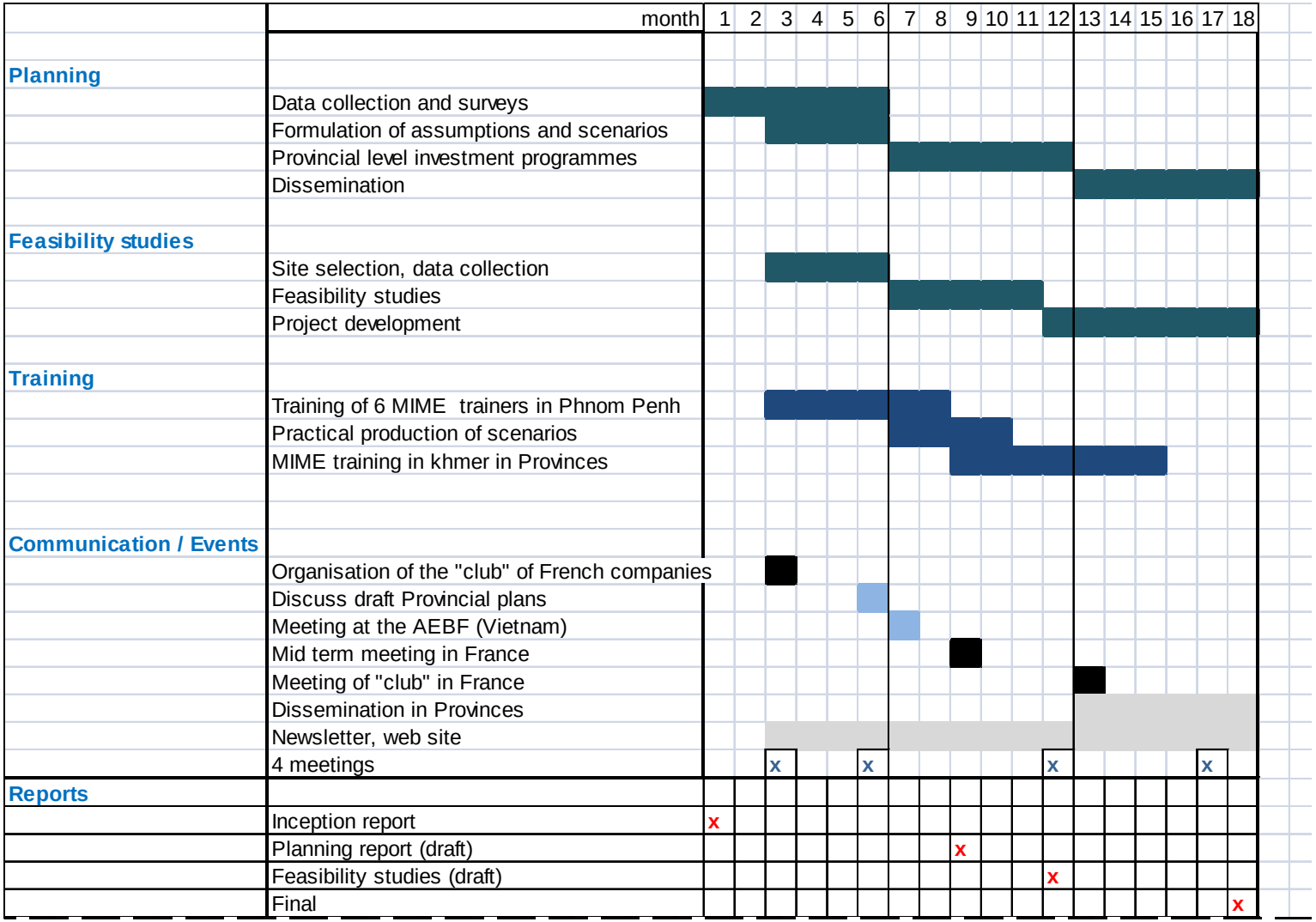
Renewable energy feasibility studies with an investment perspective

- Short list ASAP hydro and biomass potentials – about 20 potentials - 200kW to 2MW
- Criteria: reasonable investment cost and located close to a load center – with good profitability perspectives
  - June 2010: finalise the list of sites (2 to 5)
  - July to Dec 2010:
    - Socio economic and technical data collection
    - Technical design
    - Economic and financial analysis
  - Sept 2010 to March 2010:
    - Discuss possible financial support schemes: involvement of REF, setting up of a credit line by AFD / PROPARCO

Mobilisation of partners and dissemination

- Setting up in France of a Club of interested companies
  - Under the aegis of sector organisations
  - Informed of progress and opportunities on a quarterly basis
- Organisation of a side event at the AEBF – July 2010, Vietnam
  - Show the results of the planning tool
  - Mobilise industry to meet ASEAN decision makers
- Mid term meeting in France with MIME and the Ministry of finance and industry – Sept 2010
- Follow up projects for investment Jan – July 2011
- Web site: www.srep.org

Schedule



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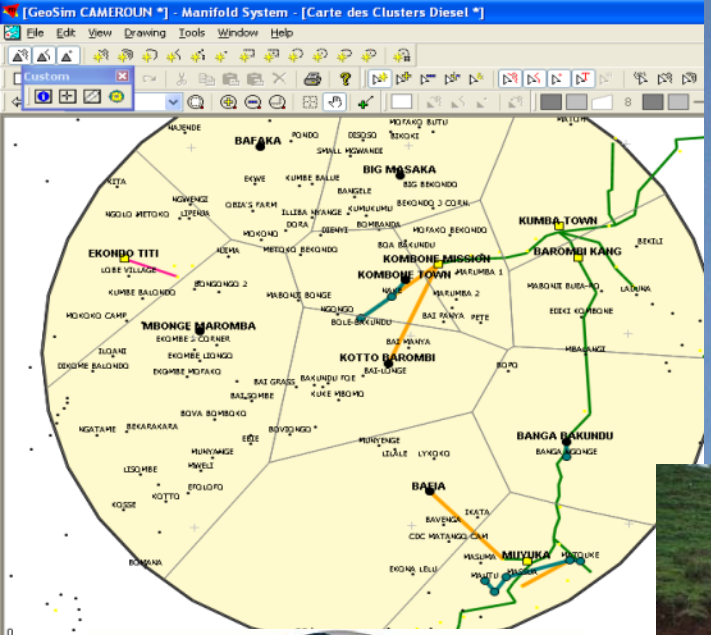
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MBONGE MAROMBA
KOTTO BAROMBI
BANGA BAKUNDU
BAFIA
MIYUKA
Area (I)

GeoSim


Regional Dissemination Workshop on Innovative Financial Schem
r Sustainable Development of Renewable Energy Project in Rural
in Indonesia, Philippines and Vietnam (IFRERA)
Auditorium DGEEU, 22 March 2006
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