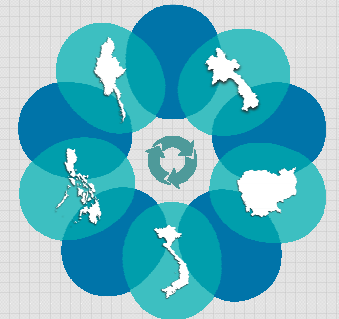


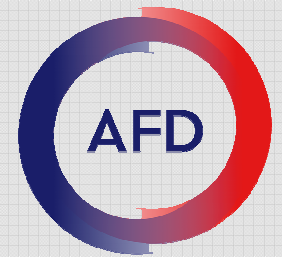
Steering Committee 23-24 January 2018 – Phnom Penh

ECOMORE 2 PROJECT COMPONENT IN LAO PDR

Marc GRANDADAM – Sébastien MARCOMBE



ECOMORE II



WP CAMBODIA



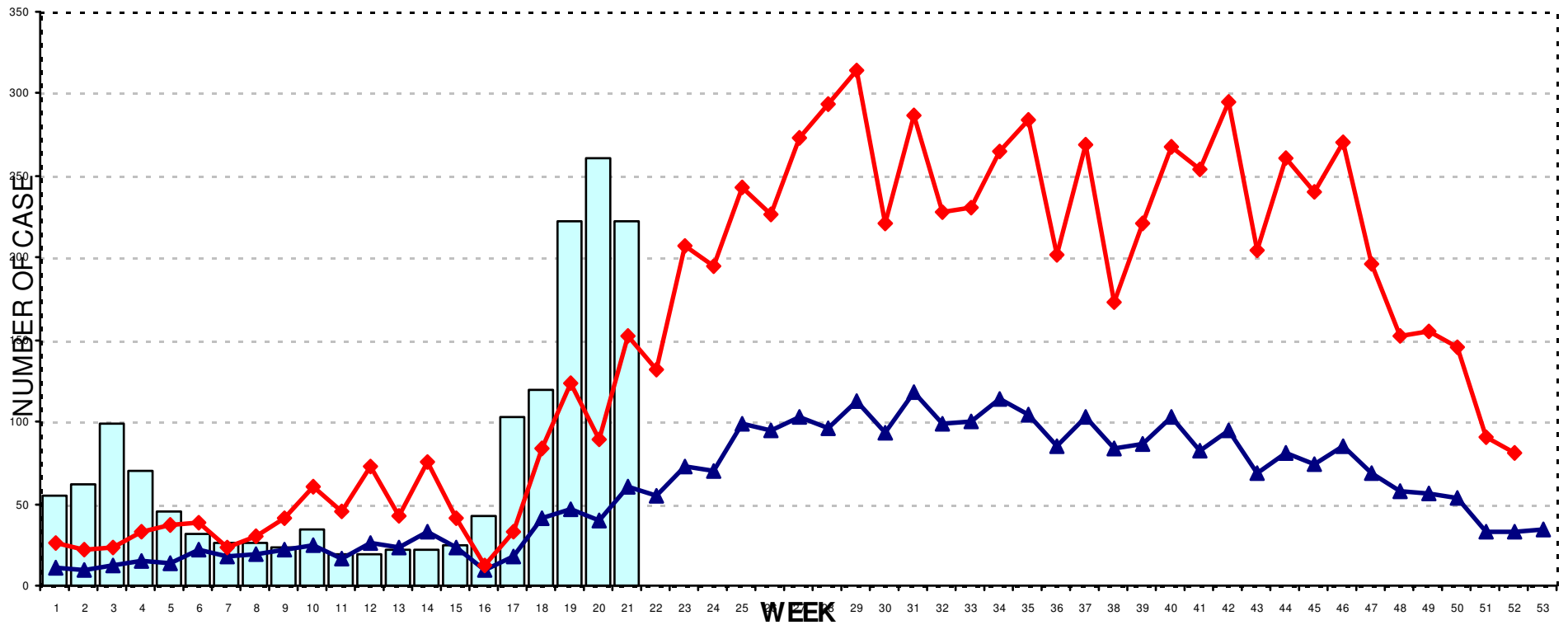
Your logo

Process of initiation of the project (1)

- Primary objective of the project
 - to develop tools for risk assessment, and control of viral diseases transmitted by *Aedes* species (i.e. dengue / chikungunya / zika) in urban areas to underpin recommendations to minimize public health impacts due to urban development and changes in lifestyle.
- Relevance at the National level
 - Dengue remains a main public health problem in Laos
 - Frequent epidemics of dengue-like syndromes / **real incidence – prevalence remain to be determined: D.L.S. = DENV**
 - Alternative etiologies **need to be identified**
 - Lao PDR faces drastic changes (urbanization; human migration; human behavior; economic...)

Dengue Syndromic-Passive surveillance (national)

Actual Case Mean Mean+2*SD



(source: MOH of Lao PDR, DCDC, 2017)

Process of initiation of the project (2)

- Primary objective of the project
 - to develop tools for risk assessment, and control of viral diseases transmitted by *Aedes* species (i.e. dengue / chikungunya / zika) in urban areas to underpin recommendations to minimize public health impacts due to urban development and changes in lifestyle.
- Relevance at the National level
 - Dengue remains a main public health problem in Laos
 - Frequent epidemics of dengue-like syndromes / real incidence – prevalence remain to be determined:
D.L.S. = DENV
 - Alternative etiologies
 - **Lao PDR faces drastic changes (urbanization; human migration; human behavior; economic...)**

VIENTIANE City

1905



Sayarath et al., 2000

1931



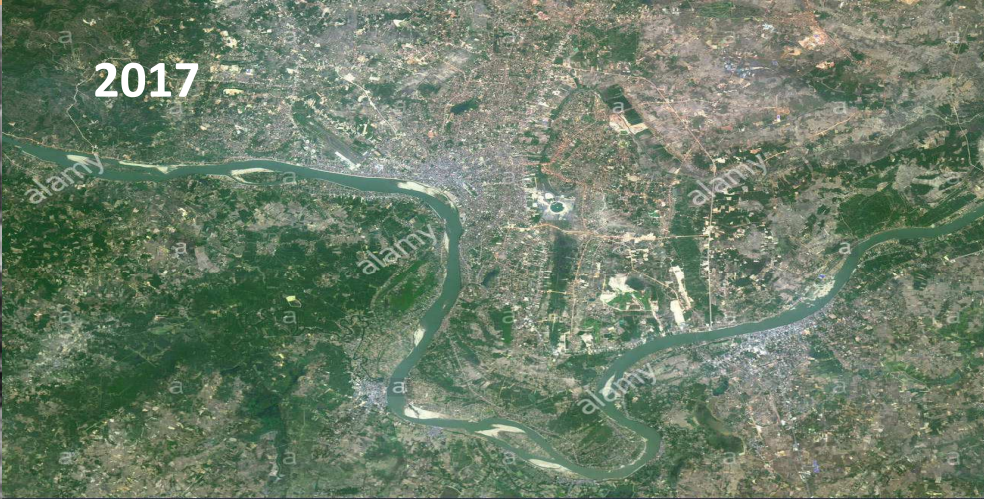
Sayarath et al., 2000

1964-75

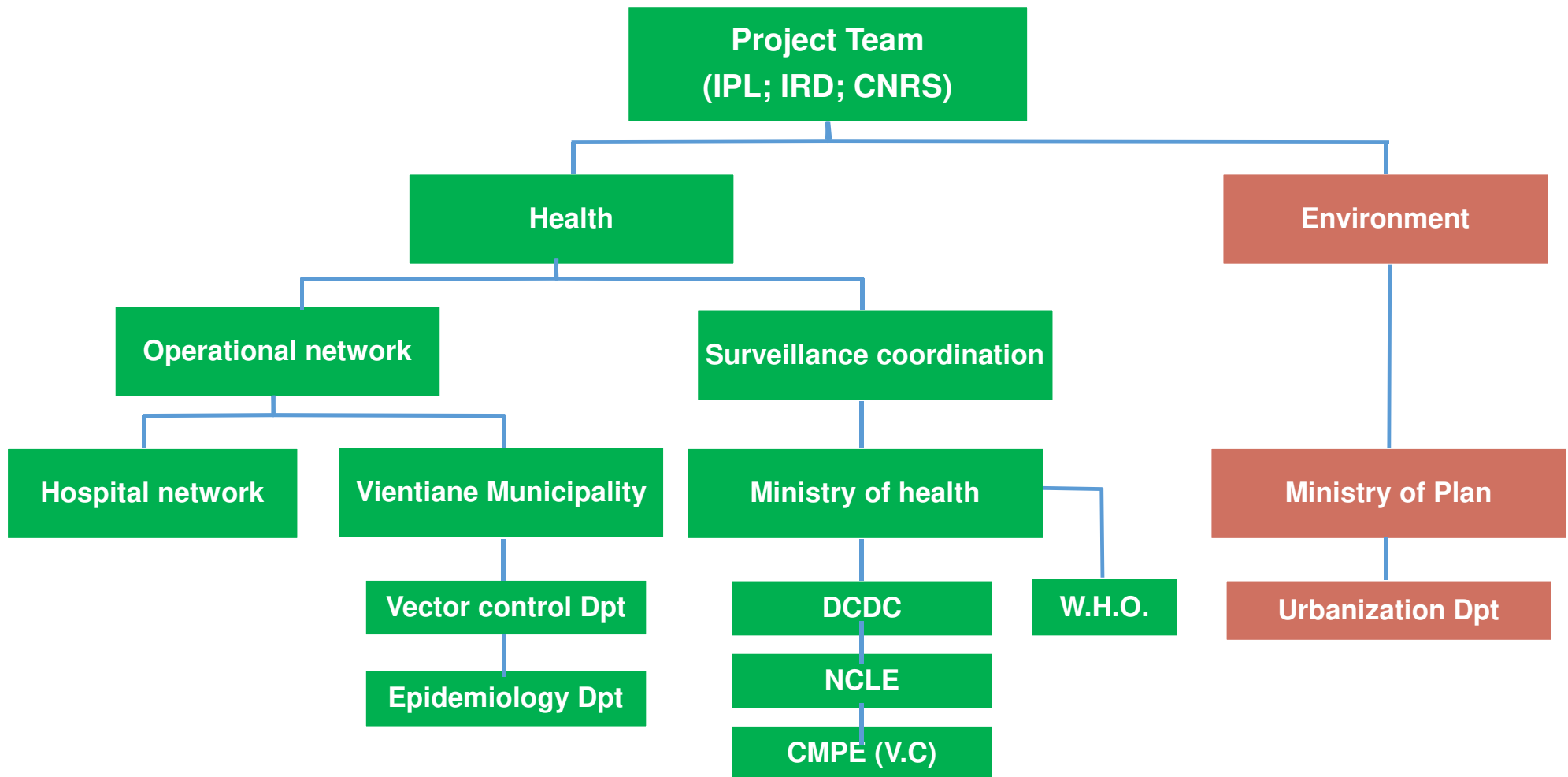


Sayarath et al., 2000

2017

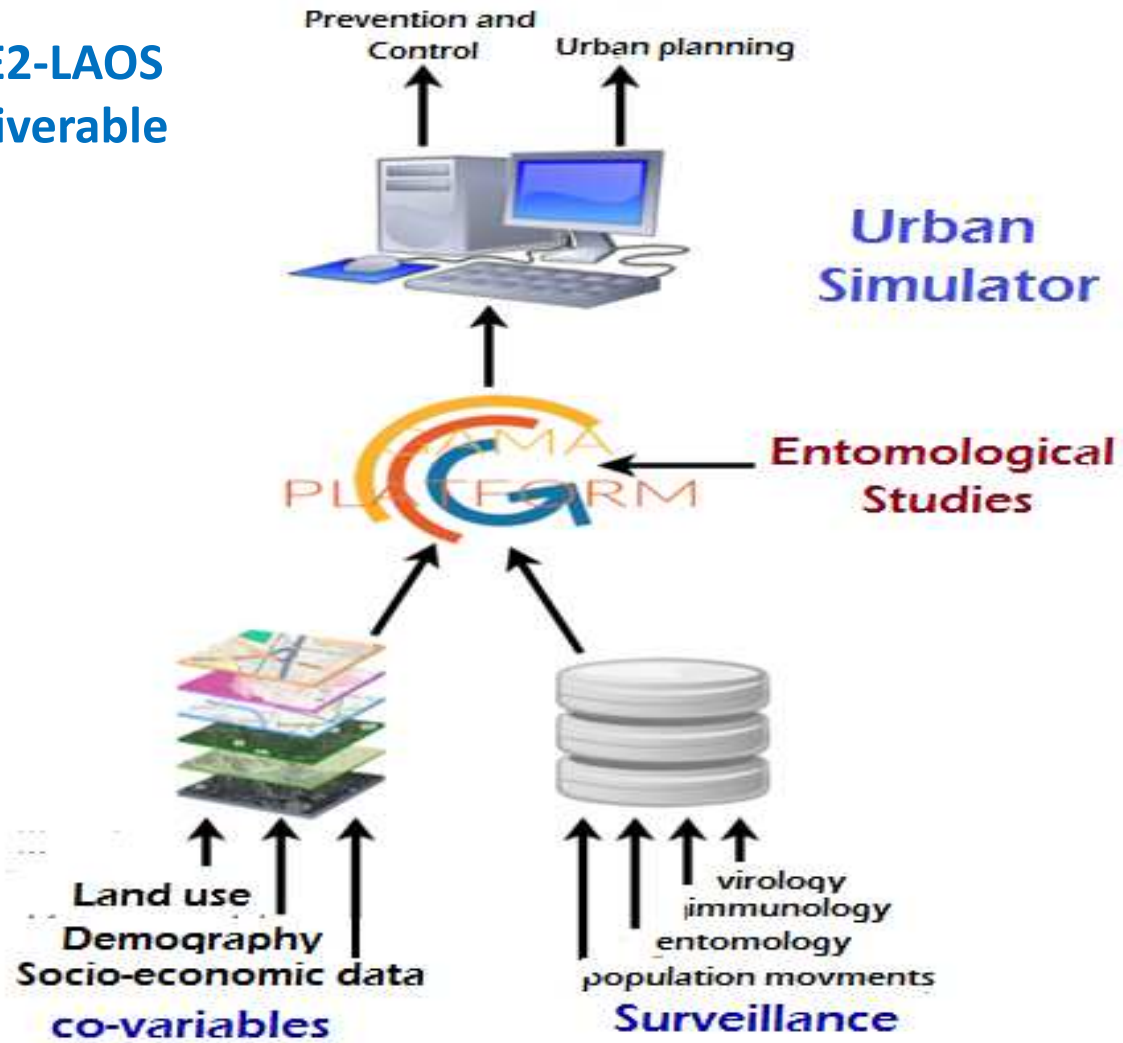


Process of initiation of the project (3)





ECOMORE2-LAOS
Major deliverable



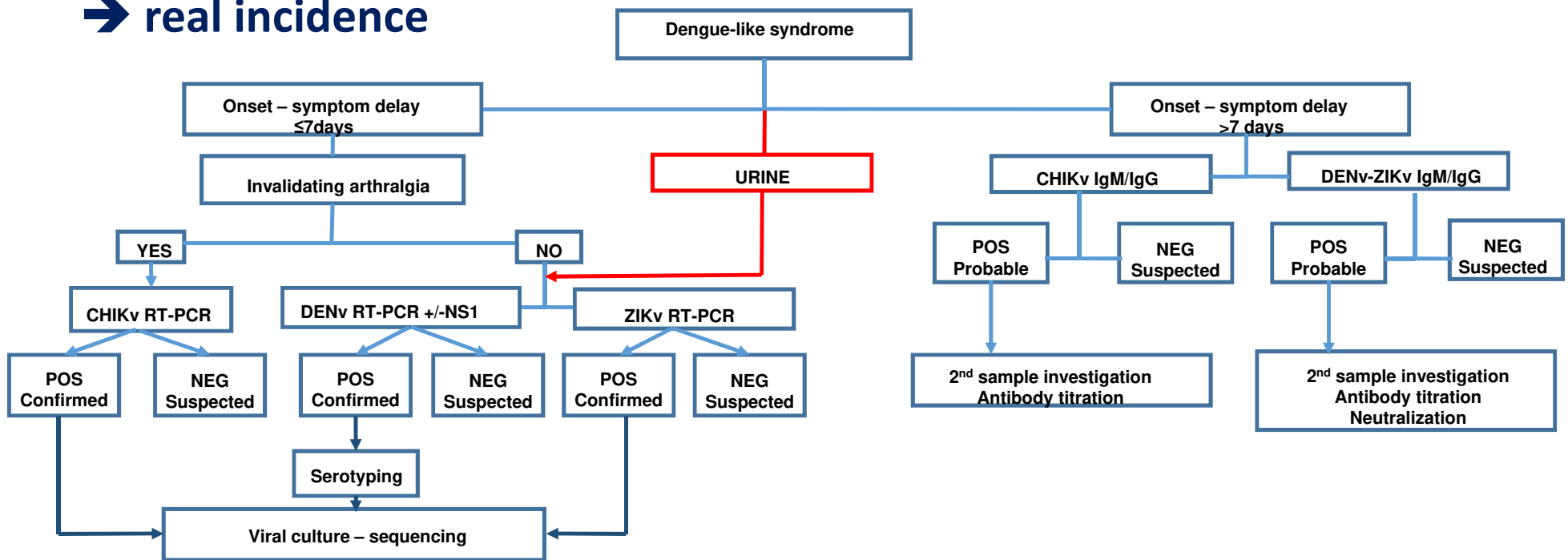
Process of initiation of the project (3)

- Experts who have participated in the design of the study
 - *Surveillance granted by research projects since 2010 (2 ACIP & 2 PTR, International Division, Institut Pasteur)*
 - *Pre and post evaluation of the projects by scientific committees*
 - *Annual scientific committee*
 - *Extra funds in 2013*
 - ➔ ***Background: reference surveillance data (6 years); in country expertise***
 - *Reinforcement of capacities:*
 - ✓ *data analysis 1 modelling: Olivier Telle (geographer; CNRS); Marc CHOISY (mathematician-expert model. Inf diseases; IRD)*
 - ✓ *epidemiology Philippe Cavaille Epidemiologist (ext); Virginie Pommelet (epidemiologist; IPL)*

Specific Objective #1: To improve surveillance data analysis - response

- Methodology: target = general population; D.L.S.; in/out patients
- Routine passive surveillance network to identify studied areas

➔ real incidence

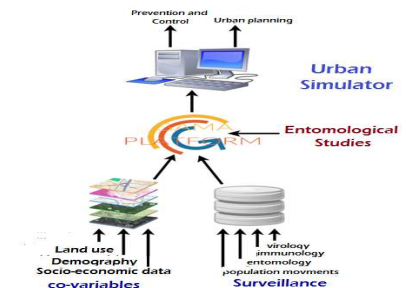


Specific Objective #1: To improve surveillance data analysis - response

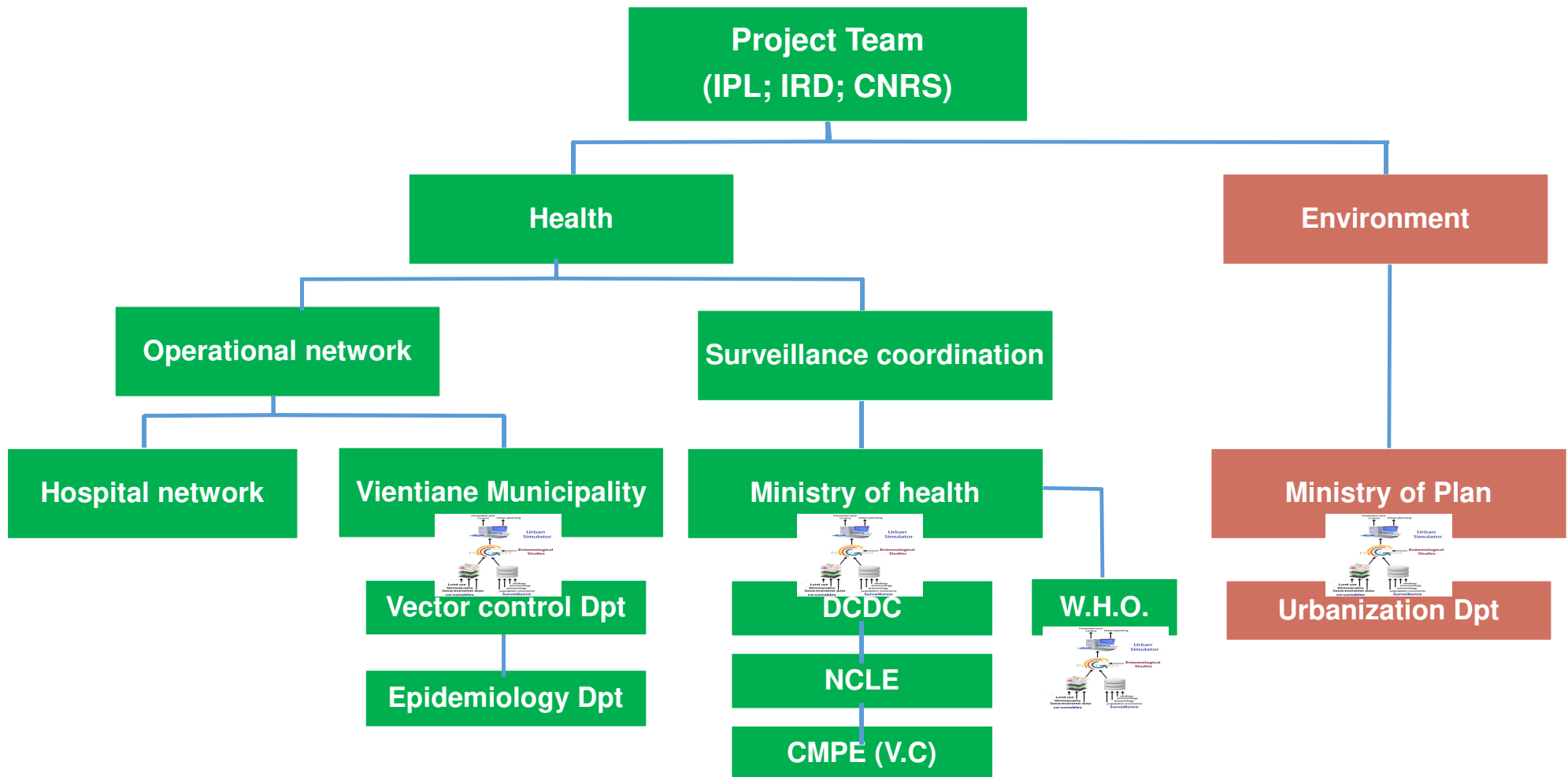
- **Methodology:** target = general population; 3 main activities
 - Routine passive surveillance network to identify studied areas
 - ➔ real incidence
 - Annual seroprevalence studies:
 - ➔ prevalence; herd immunity against the different DENV serotypes
 - Collection additional information:
 - ✓ Census data
 - ✓ Environmental info
 - ✓ Human mobility: questionnaire - real time gps follow up
 - ✓ Viral mobility: “macro / micro-phylogeography”;
 - ✓ Meteorological parameters
 - ➔ Mapping ; Data modelling

Activities correlated to the detailed protocol of objective #1

- People involved:
 - Surveillance: Public & private hospital in Vientiane; district hospitals (suburban);
 - Seroprevalence: (IPL+clin ntwk)
general population; cross sectional survey ; random cluster sampling design. Standardized interview (+/- census data?) + blood sample.
- Statistical calculation (IPL epidemio): adapted to the type of inclusion/group size
- Operational arrangements:
 - Ethical issues; Virology; patients/volunteers databases (IPL)
 - Co-variables data collection / quality control (IPL; CNRS; IRD)
 - Mapping (CNRS; IRD partners)
 - Simulation plate form development (CNRS; IRD partners)
 - ✓ retrospective + prospective surveillance data
 - ✓ Co-variables databases



Operational arrangements (continue)



Results expected of the activities

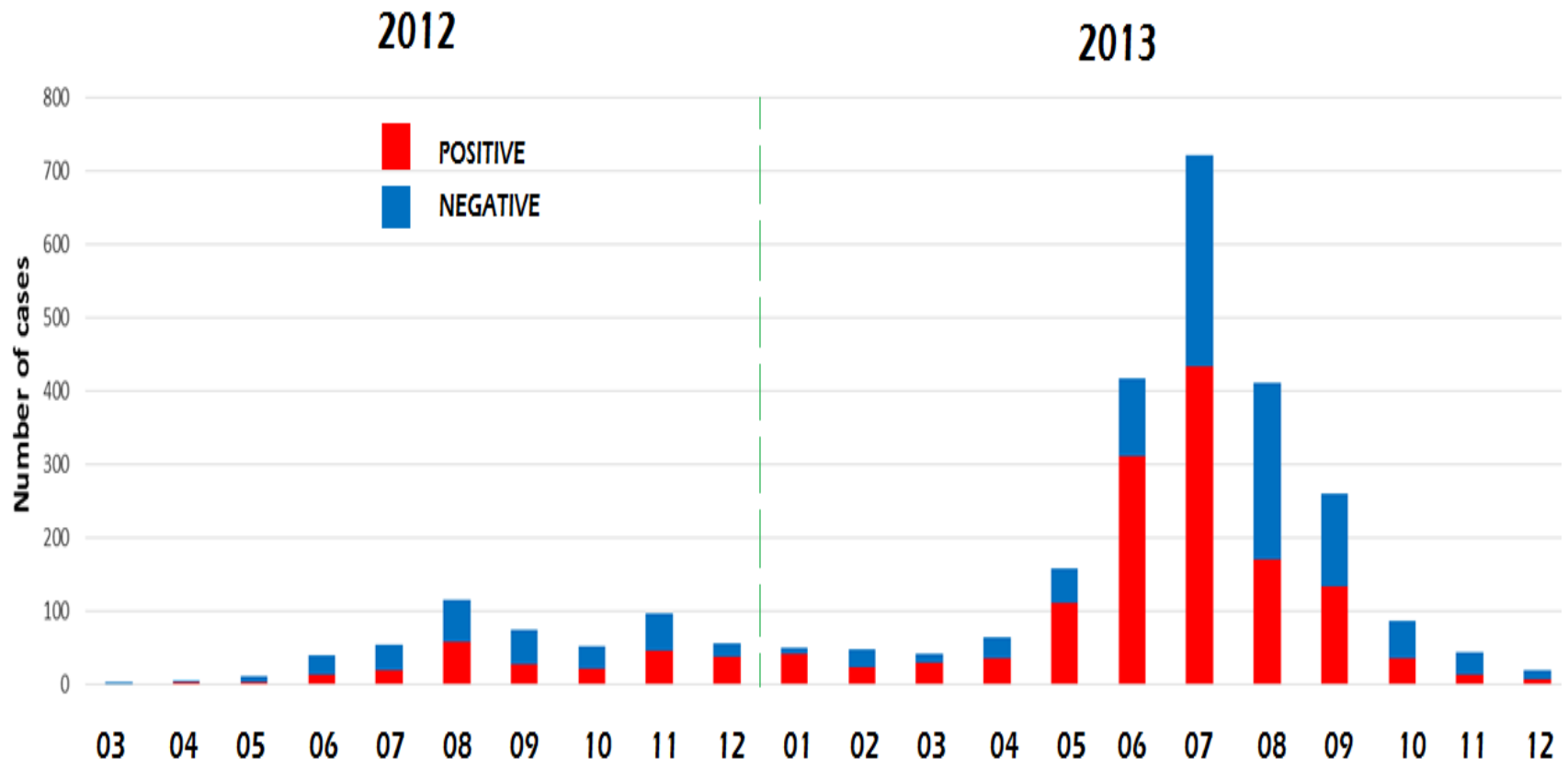
- **Passive surveillance:**

- Real time – real incidence (DENV inf vs D.L.S.)
- DENV Serotype(s) dynamic
- DENV seasonality – reference epidemic profiles
- Improvement of D.L.S. differential diagnosis → reinforcement of emergence detection
- Adjustment of surveillance capacities (economic)

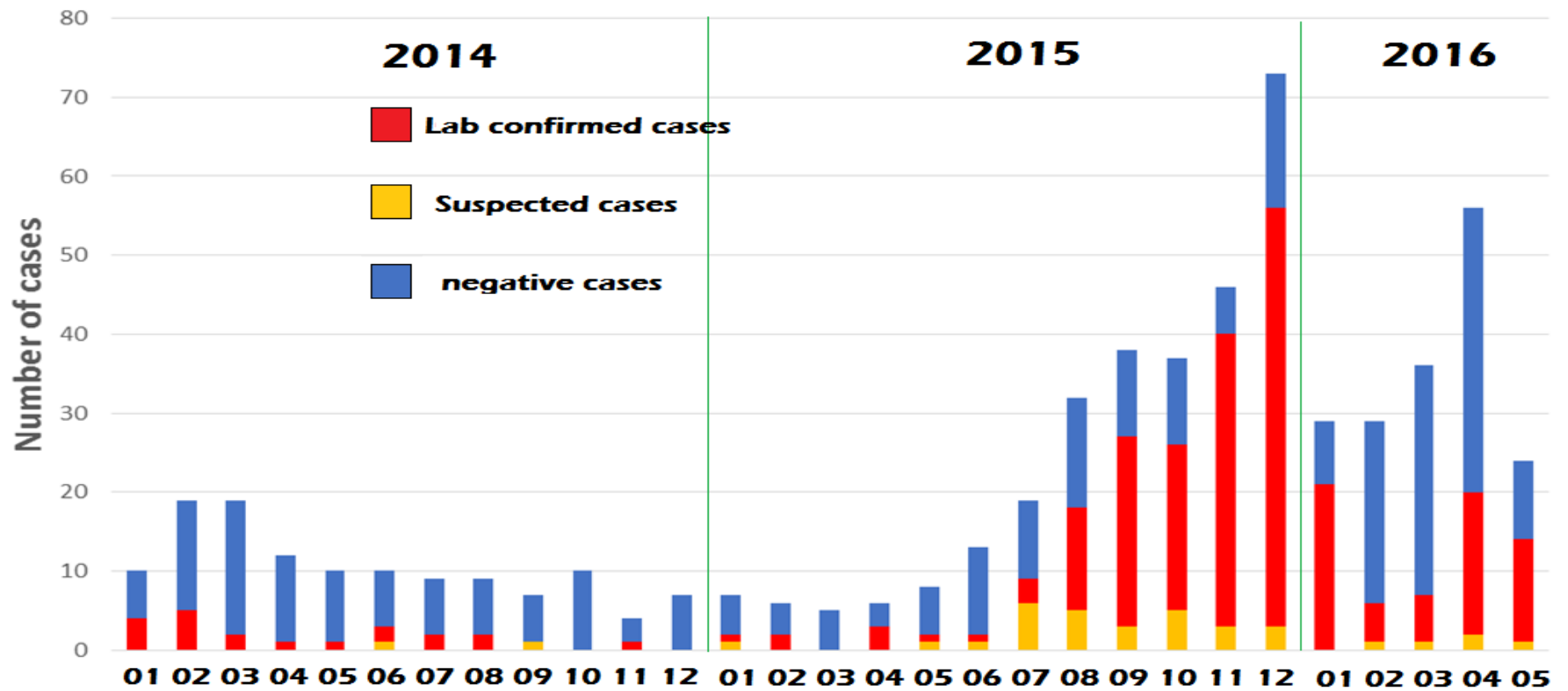
- **Seroprevalence studies**

- Real state of herd immunity against DENV serotypes
- Improvement of epidemic prediction

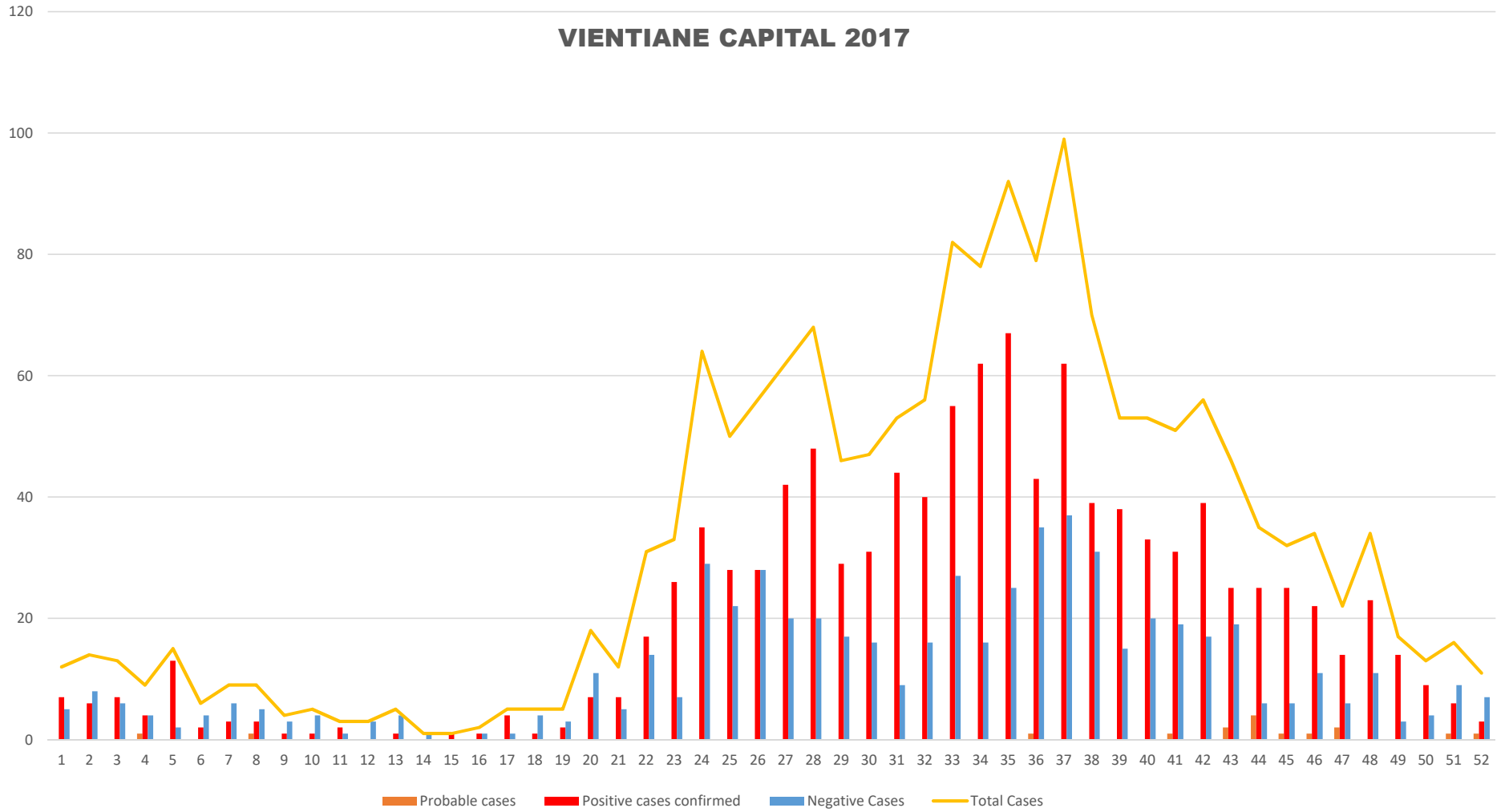
VIENTIANE CAPITAL



VIENTIANE CAPITAL

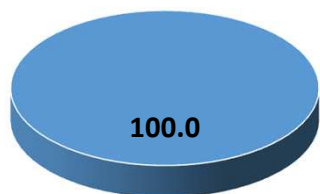


VIENTIANE CAPITAL 2017

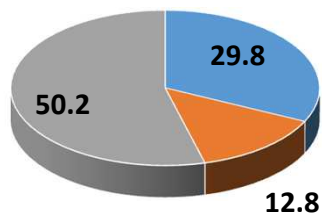


Dengue - Mesure des risques

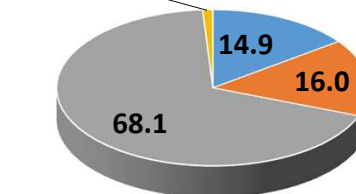
March-April 2012



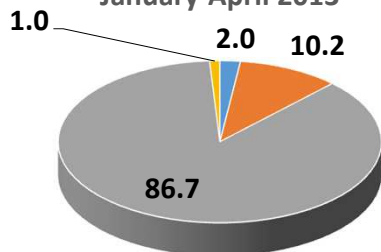
May-August 2012



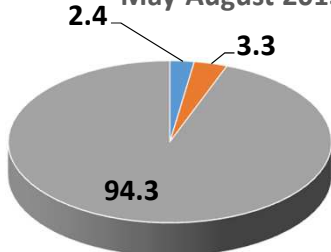
September-December 2012



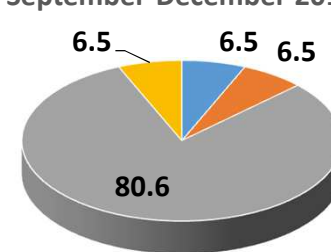
January-April 2013



May-August 2013



September-December 2013



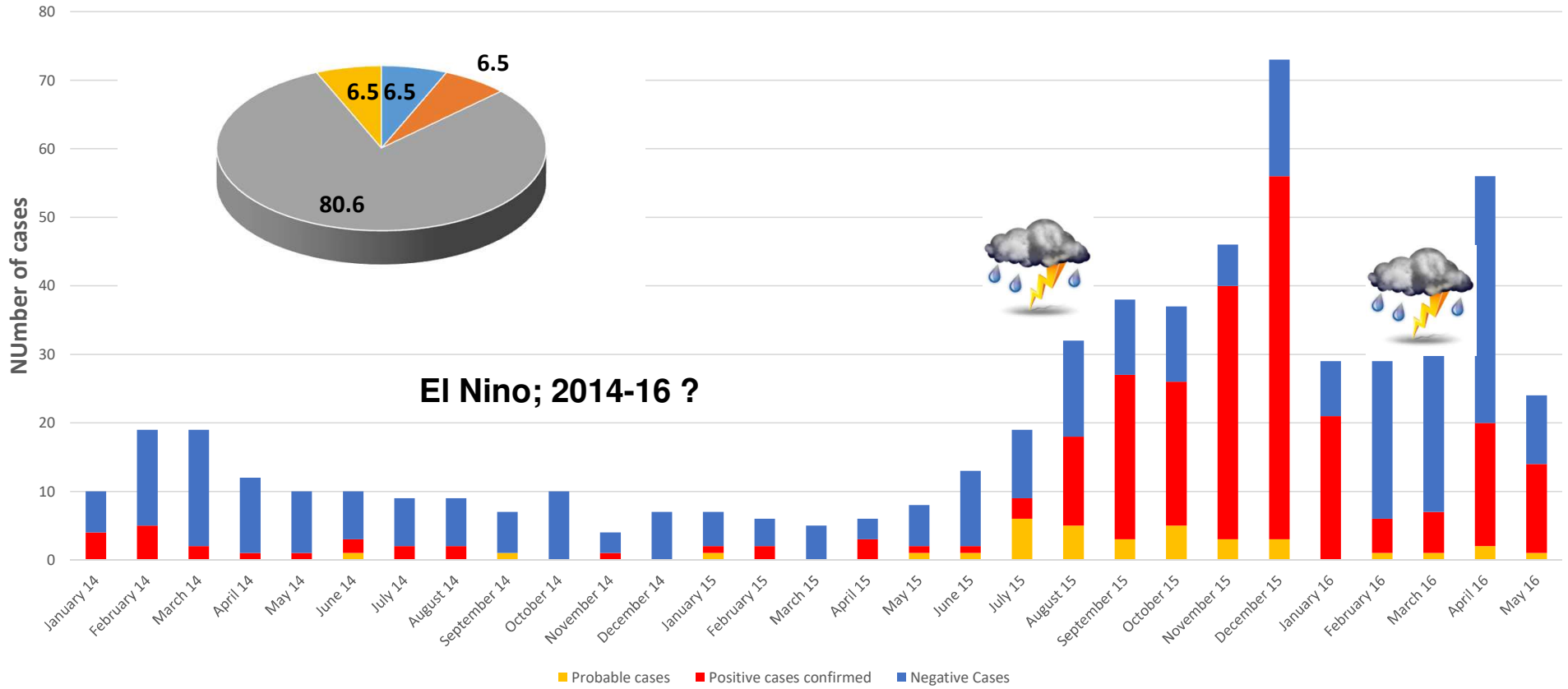
■ DEN-1 ■ DEN-2 ■ DEN-3 ■ DEN-4

→ Données historiques quantitatives

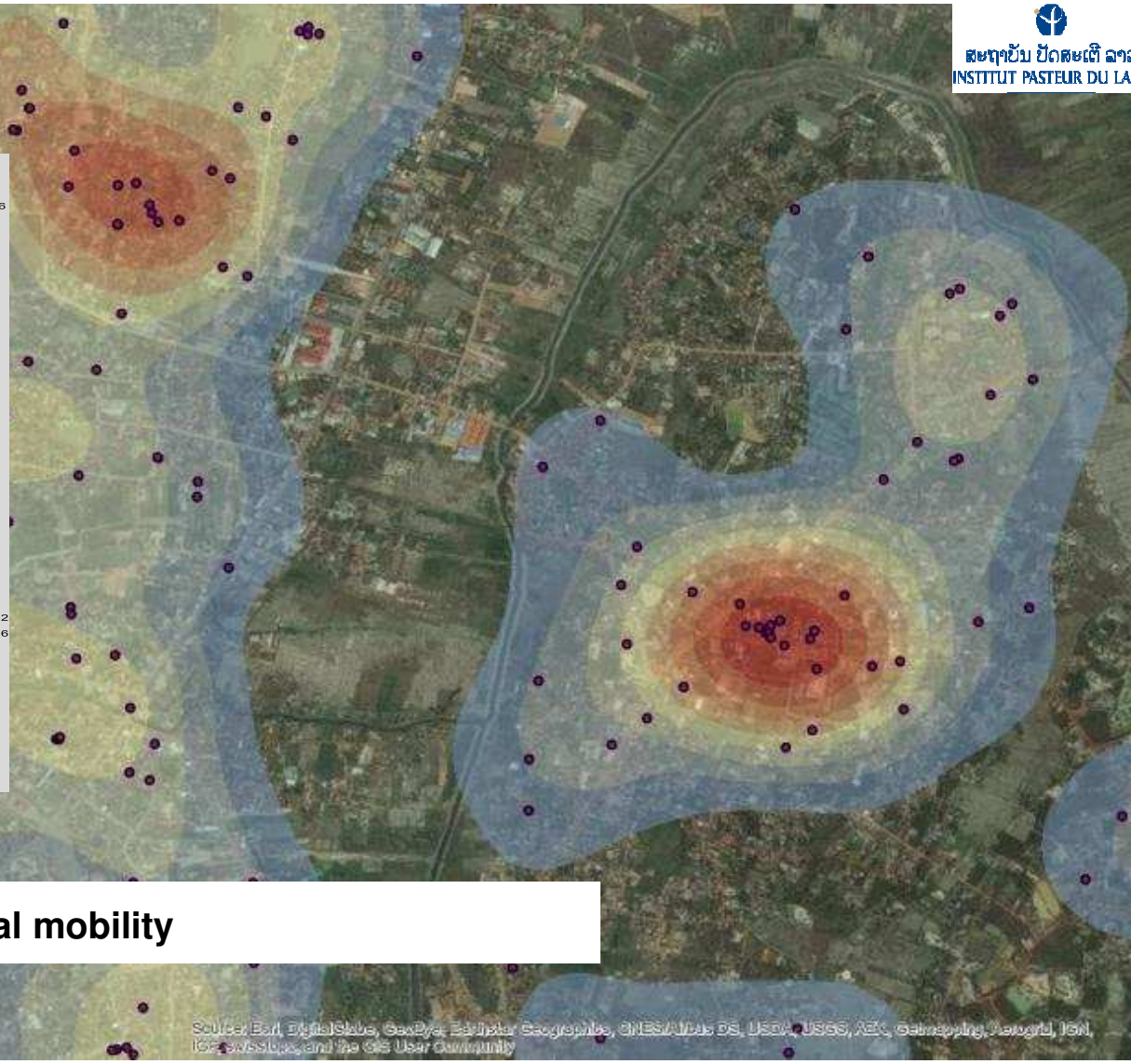
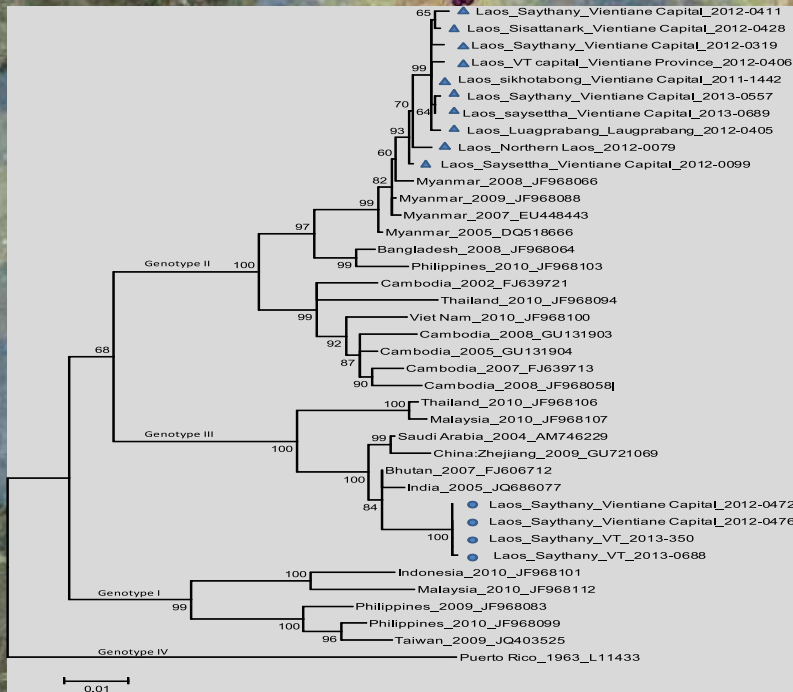
? Immunité de la population générale

PREMIERS ELEMENTS D'EVALUATION DE RISQUE

2014 - 2016



DENV Phylo-geography



Human / viral mobility

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, Aero, GeoMapping, AeroGRID, IGN, IGN, swisstopo, and the GIS User community

Results expected of the activities

- *Passive surveillance:*
 - *Real time – real incidence*

- *Data analysis & Outbreak simulator development*
 - *Annual Mapping → Dynamic mapping*
 - *Data modelling → integration of co-variables (meteo; mobilities; ...)*
 - *Scenarios based on past surveillance data (6 years)*
 - *Tests of prediction capacities – comparison to real time surveillance*

Steering Committee 23-24 January 2018 – Phnom Penh

Dengue vector surveillance and innovative strategies for vector control in Laos.

Entomology WP, ECOMORE2
Sebastien Marcombe



WP LAOS

Process of initiation of the Entomological WP, Vientiane, Laos

- Objectives

- Entomological **surveillance** to define **dynamics** of *Aedes* vectors and Identify **active zones of transmission**
- Evaluate **innovative strategies** of vector control (In2Care traps)
- Measure and Map **insecticide resistance** levels of the *Aedes* populations in Vientiane

- Involvement of Authorities

- Presentation of the project to representatives of DCDC, MoH, and Vientiane Districts

- Relevance at the National level

- In concordance with the new **National Strategic Plan against Dengue** in Laos

- Experts who have participated in the design of the study

S. Marcombe, M Drandadam (IPL), M. Choisy (IRD, Vietnam), O. Telle (CNRS, India)

Specific Objective 1: Dynamics of vectors and surveillance in Dengue hotspots

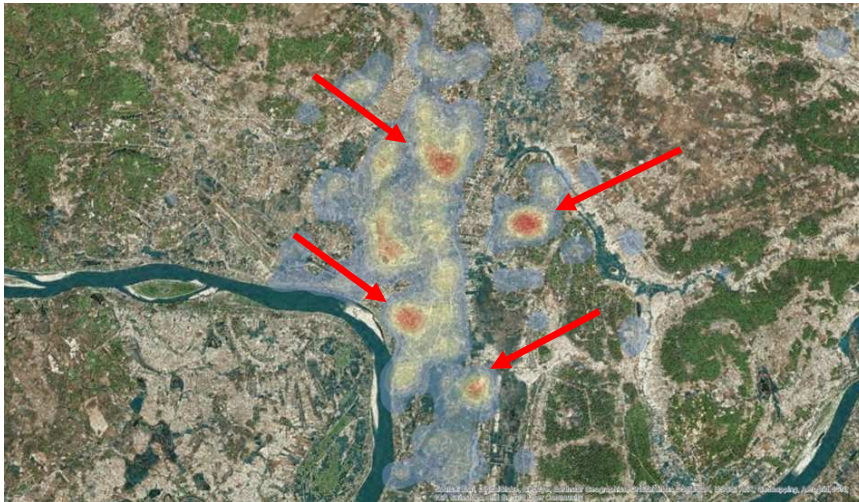
- 4 villages selected in Vientiane capital
- 2 BG sentinel traps and 2 oviposition traps / village
- Mosquito abundance (every week annually)
- Arbovirus infestation rates in vectors



Ovitrap



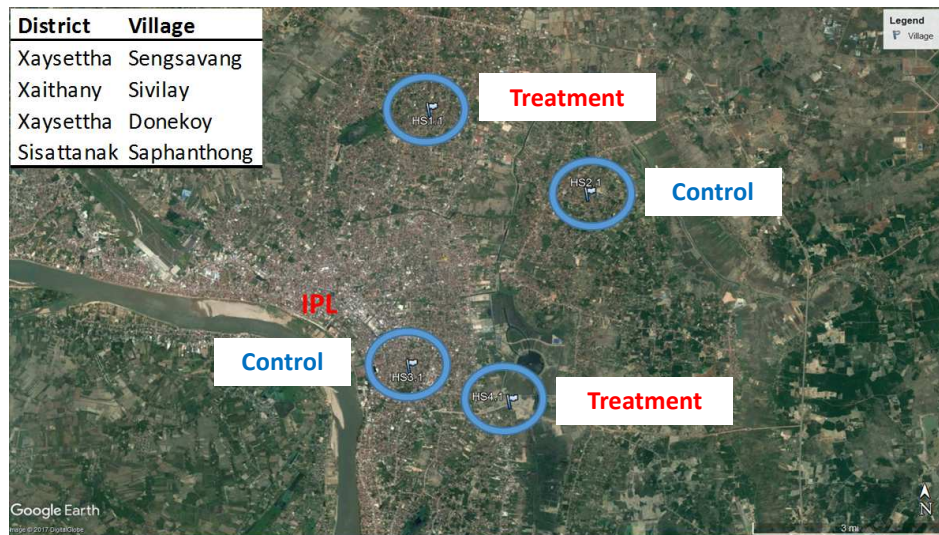
BG trap



Density of dengue confirmed cases in Vientiane (2012/2016),
Virology Department IPL.



Specific Objective 2: Innovative vector control strategy, In2Care traps



Localization of the selected sites for In2Care traps implementation in Vientiane



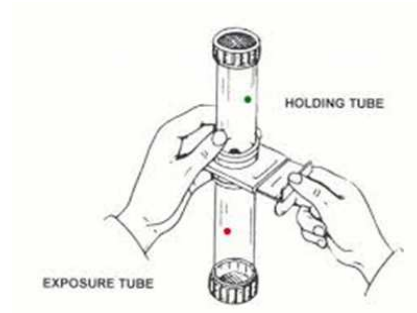
Specific Objective 2: Innovative vector control strategy, In2Care traps

- Preliminary small scale study, IPL
 - Residual efficacy of the traps (water levels, insecticide efficacy during 3 months)
 - Reduction of mosquito abundance in the area



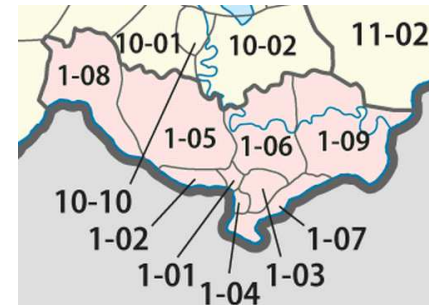
Specific Objective 3: Insecticide resistance

- Measure the **levels of insecticide resistance** in the identified hotspot against conventional insecticides against **new insecticides**, on Larvae and Adults using WHO standard bioassays



WHO criteria

- **Susceptible**
[98-100% mortality]
- **Suspected resistance**
[90-98% mortality]
- **Resistance**
[<90% mortality]



Vientiane districts map

Expected results

- Improvement of vector control strategy in identified/potential hotspots (2019)
- Evaluation of relevance to implement a vector control strategy during the dry season (2019)
- Mapping of insecticide resistance in Vientiane (recommendations on insecticide use in Vientiane, *end of 2018*)



**National Strategic
Plan for Dengue
control in Laos**

Monitoring of realization of the objectives

- Indicator
 - Improvement of vector control strategies in identified/potential hotspots
- Means of verification
 - Results of insecticide resistance tests
 - Results of vector abundance in the hotspots before, during and after intervention.

Acknowledgements

- IPL technicians and scientists
- Thank you!



MONITORING

- *Indictors*

Objectively verifiable indicators	Verification
<ul style="list-style-type: none">▪ The seroprevalence of the population of Vientiane is known▪ Dynamic maps of dengue transmission are established in the study area▪ The effectiveness of the vector control is demonstrated by comparing the results of trapping in the intervention area vs. non-intervention▪ The dengue surveillance system allows to demonstrate the impact of vector control strategy▪ The epidemic simulator has anticipated dengue transmission in the third year of the project	<ul style="list-style-type: none">▪ Annual Activity Report▪ Maps of dynamic transmission▪ Real-time monitoring of project results on the website▪ Report on meetings involving the authorities▪ Scientific Publications

M1 M2 M3 M4 M5 M6 M7 M8 M9 M10 M11 M12 M13 M14 M15 M16 M17 M18 M19 M20 M21 M22 M23 M24 M25 M26 M27 M28 M29 M30 M31 M32 M33 M34 M35 M36

Activity

A.1 Selection of areas of intervention

A.2 Implementation of serosurveys to determine the prevalence of dengue

A.3 Implementation of surveillance in sentinel hospitals

A.4 Differential diagnosis algorithm of dengue-negative specimens

A.5 Geo-location of dengue confirmed cases and mobility study

A.6 Gathering meteorological and environmental data

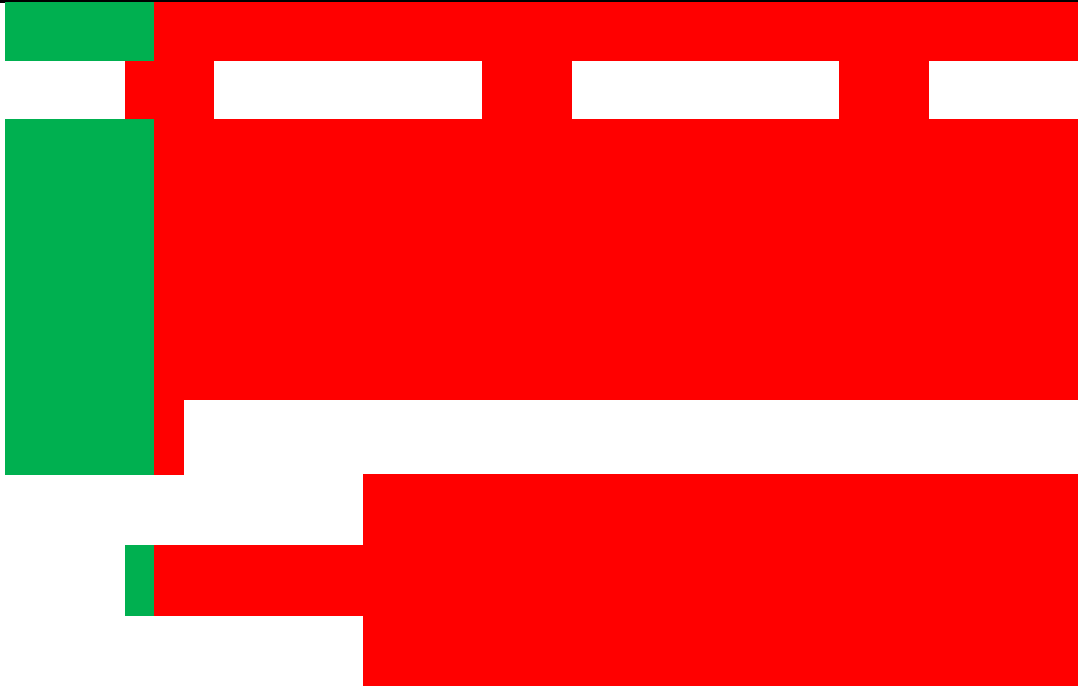
A.7 Entomological surveillance

A.8 Assessment of resistance to insecticides

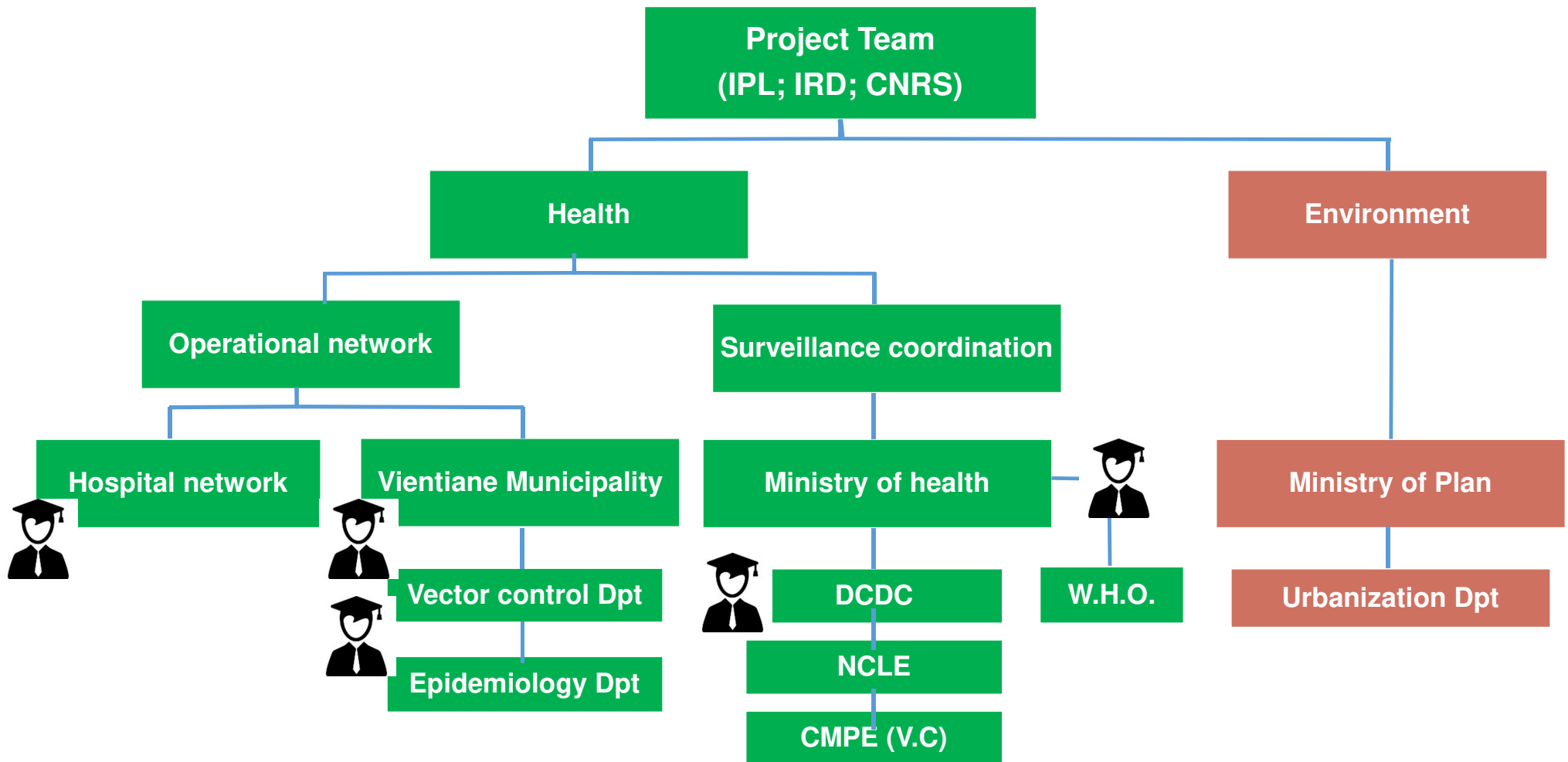
A.9 Evaluation of new vector control strategies

A.10 Data modeling

A.11 Development of an outbreak simulator -testing



KNOWLEDGE TRANSLATION



Acknowledgements

➤ Collaborations:

- ✓ **CNRS: CNRS, UMR 8504, Paris 1**
- ✓ **IRD: MIVEGEC (Univ. Montpellier-CNRS 5290-IRD 224), Hanoi, Vietnam**
- ✓ **Institut Pasteur Paris: Environment and Infectious risks Unit**

➤ Fundings

- ✓ **Institut Pasteur Paris, International Division: ACIP-A16-2011; PTR-408, 2011; ACIP-A09-2014; ACIP-A15-2014; PTR491, 2014)**
- ✓ **WHO (AusAID/WHO)**
- ✓ **UnitedDengue**

