ADAPTING TO IMPACT OF CLIMATE CHANGE ON DENGUE HEMORRHAGIC FEVER IN INDONESIA

Budi Haryanto
DECISION MAKERS

- Minister of Health
- Director of the National Planning and Development Board
TEMPERATURE PROJECTION ON INDONESIA

Source: NOAA, 2002

Source: Susandi, 2005
INCREASING TEMPERATURE IN JAKARTA & SURABAYA 1900 - 2000

JULY

Jakarta : 1.4°C
Surabaya : 1.46°C

Surabaya : 3.29°C
Jakarta : 1.04°C

GLOBAL : 0.7°C/100 years
RAINFALL TREND IN INDONESIA 1950-2000

Source: NOAA-CIRES (2005)

Scatter Diagram HH vs CH Rata-2 Area Bulanan Kota Surabaya (1973-2007)

\[ y = 0.4827x^2 + 15.973x; \quad R^2 = 0.8971 \]
Empirical Model Prediction for Rain Fall
Jakarta 1995-2005

Scatter Diagram HH vs CH Propinsi DKI Jakarta tahun 1995-2006

$y = 14.005x; R^2 = 0.6859$
RAINFALL AND DHF CASES IN DKI JAKARTA 1993-2006

\[ y = 258.62x - 395.27 \]

\[ R^2 = 0.3633 \]
PREDICTION OF DHF CASES IN SURABAYA 2007-2015

- Linear regression: $y = 360.05x + 894.78$, $R^2 = 0.332$
- Exponential regression: $y = 1203.6e^{0.1315x}$, $R^2 = 0.2011$
PREDICTION OF DHF CASES IN JAKARTA 2007-2015

\[ y = 1618.4x + 1357.5 \; ; \; R^2 = 0.593 \]
Using data cases of dengue fever since 1968-2007, scenario that cases of dengue fever in years 2050 and 2100 in Indonesia, up to 150,000/275,000 and 275,000/675,000 cases.
DHF CASES BY CITIES/DISTRICTS IN INDONESIA 1968 - 2008

Incidence Rate per 100,000

Year

#Districts/Cities


0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00

0 50 100 150 200 250 300 350 400

INSIDENS

KAB/KOTA TERJANGKIT
MAIN PROBLEM

Rising of DHF incidence in Indonesia
Rising incidence of DHF in Indonesia

**Causes**
- Increasing breeding places
- Increasing rain fall & temperature
- Climate change
- Inability to control DHF
- Improper program implementation
- Lack of community participation
- Lack of SOP
- Lack of health promotion
- Many infected persons
- Inaccurate diagnosis
- ‘Carrier’ people movement
- Late diagnosis
- Difficult to be tackled

**Effects**
- Reduce productivity
- Increase absenteeism
- Fear in Community
- Morbidity
- Mortality
- Indonesia
- International
- Economic loss
- Risk of spread
- Putting more people at risk worldwide
- Threat tourism
- Inability to control DHF
- Inaccurate diagnosis
- ‘Carrier’ people movement
- Late diagnosis
- Difficult to be tackled

**Scoping Problem**
- Economic loss
- Risk of spread
- Putting more people at risk worldwide
- Threat tourism
- Inability to control DHF
- Inaccurate diagnosis
- ‘Carrier’ people movement
- Late diagnosis
- Difficult to be tackled

**Problem**
- Rising incidence of DHF in Indonesia

**Effects**
- Economic loss
- Risk of spread
- Putting more people at risk worldwide
- Threat tourism

**Causes**
- Increasing breeding places
- Increasing rain fall & temperature
- Climate change
- Inability to control DHF
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- Many infected persons
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- ‘Carrier’ people movement
- Late diagnosis
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PROBLEM

Rising incidence of DHF in Indonesia

CAUSES

Number of mosquito increased

- Increasing breeding places

- Increasing rain fall & temperature

- Climate change

Many infected persons

Inability to control DHF

SOLUTIONS

Burying, Covering, and Cleaning the potential mosquito breeding places (community & government)

Intensifying control for Aedes’ adult & pupa (comm & govt)

Early warning system information from BMKG sent to government to activate control of breeding places (govt & univ.)

Mitigation to reduce sources of GHG (govt, univ., NGO & comm)
# Burying, Covering, & Cleaning Mosquito Breeding Places

<table>
<thead>
<tr>
<th>WHAT SHOULD DO</th>
<th>STAKE HOLDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>To find potential Aedes’s breeding places at the home yard (can, bottle, etc.)</td>
<td>Individual, household, &amp; community</td>
</tr>
<tr>
<td>To bury the removable breeding places</td>
<td>Individual, household, &amp; community</td>
</tr>
<tr>
<td>To cover the non-removable breeding places</td>
<td>Individual, household, &amp; community</td>
</tr>
<tr>
<td>To clean or drain clean water which is potential for Aedes’s breeding places</td>
<td>Individual, household, &amp; community</td>
</tr>
</tbody>
</table>
## INTENSIFYING CONTROL OF AEDES’S ADULT & PUPA

<table>
<thead>
<tr>
<th>WHAT SHOULD DO</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Health promotion &amp; education of BCC to community</td>
<td>Local Health Office</td>
</tr>
<tr>
<td>Training of eradicating Aedes’s adult (fogging) and pupa surveillance</td>
<td>MOH &amp; Local Health Office</td>
</tr>
<tr>
<td>To do fogging properly in the area of new DHF patient living</td>
<td>Local Health Office &amp; Public Health Center</td>
</tr>
<tr>
<td>Surveillance of Aedes’s pupa and breeding places</td>
<td>Local Health Office &amp; Public Health Center</td>
</tr>
<tr>
<td>Community empowerment for combating Aedes’s adult and pupa</td>
<td>Public Health Center &amp; Local Government</td>
</tr>
</tbody>
</table>
### EARLY WARNING SYSTEM

<table>
<thead>
<tr>
<th>WHAT SHOULD DO</th>
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</tr>
</thead>
<tbody>
<tr>
<td>To generate collaboration of Early Warning System between MOH &amp; BMKG</td>
<td>MOH</td>
</tr>
<tr>
<td>BMKG to send warning to Local Health Office of the increasing trend of rainfall &amp; temperature within 24 hours</td>
<td>BMKG, Local Health Office, MOH</td>
</tr>
</tbody>
</table>
# Mitigation to Reduce Sources of Green House Gases

<table>
<thead>
<tr>
<th>What Should Do</th>
<th>Stake Holders</th>
</tr>
</thead>
<tbody>
<tr>
<td>To take part to reduce all energy uses as a daily life</td>
<td>Individual, community</td>
</tr>
<tr>
<td>To take part to generate ‘green’ environment</td>
<td>Individual, community</td>
</tr>
<tr>
<td>To take part to act ‘environmental friendly’ behavior</td>
<td>Individual, community</td>
</tr>
<tr>
<td>To prioritize climate change on the national development</td>
<td>President, MOH, Bappenas</td>
</tr>
<tr>
<td>To involve other sectors and stake holders in implementing national mitigation strategy</td>
<td>Central government, Local government, Civil society, NGOs</td>
</tr>
</tbody>
</table>
PROBLEM

Rising incidence of DHF in Indonesia

CAUSES

Number of mosquito increased

Inability to control DHF

Many infected persons

Late diagnosis

‘Carrier’ people movement

Inaccurate diagnosis

SOLUTIONS

Health promotion on recognizing the symptoms of DHF (govt)

Send the DHF suspect to hospital immediately (comm)

Capacity building for medical, health service providers, and laboratories (govt & univ.)

Health promotion on recognizing the symptoms of DHF (govt) and Delay for travelling (comm)
## HEALTH PROMOTION ON RECOGNIZING DHF’S SYMPTOMS

<table>
<thead>
<tr>
<th>WHAT SHOULD DO</th>
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</tr>
</thead>
<tbody>
<tr>
<td>To develop health promotion materials on DHF symptoms and early prompt treatment for community</td>
<td>MOH, Local health office</td>
</tr>
<tr>
<td>To conduct health promotion and education on DHF symptoms and early prompt treatment to community</td>
<td>Local health office, Health center, key persons in community</td>
</tr>
<tr>
<td>To use media for disseminating health promotion on DHF symptoms and early prompt treatment to community</td>
<td>MOH, local health office, local government</td>
</tr>
</tbody>
</table>
## SEND DHF’S SUSPECT TO HOSPITAL IMMEDIATELY

<table>
<thead>
<tr>
<th>WHAT SHOULD DO</th>
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</tr>
</thead>
<tbody>
<tr>
<td>To identify member of family and neighborhood who having symptoms like DHF</td>
<td>Individual, household, community</td>
</tr>
<tr>
<td>To send those who have symptoms like DHF to hospital immediately</td>
<td>Individual, household, community</td>
</tr>
</tbody>
</table>
## Capacity Building for Medical Health Services & Laborants

<table>
<thead>
<tr>
<th>WHAT SHOULD DO</th>
<th>STAKE HOLDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>To conduct frequent workshop on DHF treatment for medical and health service officers</td>
<td>MOH, local health office, hospitals</td>
</tr>
<tr>
<td>To conduct training on Laboratory analysis for DHF</td>
<td>MOH, local health office, hospitals</td>
</tr>
<tr>
<td>To standardize the DHF treatment management and laboratory analysis</td>
<td>MOH</td>
</tr>
</tbody>
</table>
HEALTH PROMOTION ON THE SYMPTOMS OF DHF & DELAY TRAVELLING

<table>
<thead>
<tr>
<th>WHAT SHOULD DO</th>
<th>STAKE HOLDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>To conduct health promotion and education on DHF symptoms and early prompt treatment to community</td>
<td>Local health office, health center, local government</td>
</tr>
<tr>
<td>To recognize the DHF symptoms and decide to delay for travelling</td>
<td>Individual, community</td>
</tr>
</tbody>
</table>
PROBLEM

Rising incidence of DHF in Indonesia

CAUSES

Number of mosquito increased

Inability to control DHF

Many infected persons

Improper program implementation

lack of community participation

Lack of SOP

lack of health promotion

Lack of capacity in MOH

SOLUTIONS

Capacity building for health officers and supervision (govt & univ.)

Capacity building for health officers and revitalizing current SOP (govt & univ.)

Health promotion & community empowerment (govt & univ.)

Capacity building for health officers, revitalizing program and budget allocation (govt & univ.)

Advocacy, capacity building, political awareness (univ. & govt)
### CAPACITY BUILDING FOR HEALTH OFFICERS AND SUPERVISION

<table>
<thead>
<tr>
<th>WHAT SHOULD DO</th>
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</tr>
</thead>
<tbody>
<tr>
<td>To conduct training on DHF control management</td>
<td>MOH, Local health office</td>
</tr>
<tr>
<td>To facilitate equipments and materials for DHF</td>
<td>MOH, Local health office</td>
</tr>
<tr>
<td>control implementation</td>
<td></td>
</tr>
<tr>
<td>To provide appropriate funding for DHF control</td>
<td>MOH, Local health office, local government</td>
</tr>
<tr>
<td>implementation</td>
<td></td>
</tr>
<tr>
<td>To supervise regularly on DHF control implementation</td>
<td>Local health office</td>
</tr>
</tbody>
</table>
## CAPACITY BUILDING FOR HEALTH OFFICERS & REVITALIZE SOP

<table>
<thead>
<tr>
<th>WHAT SHOULD DO</th>
<th>STAKE HOLDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>To revitalize the current standard operating procedure of DHF program based on empirics, current research, and theories</td>
<td>MOH</td>
</tr>
<tr>
<td>To conduct training for the assigned health officers on new SOP of DHF</td>
<td>MOH, Local health office</td>
</tr>
</tbody>
</table>
# HEALTH PROMOTION AND COMMUNITY EMPOWERMENT

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<thead>
<tr>
<th>WHAT SHOULD DO</th>
<th>STAKE HOLDERS</th>
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</thead>
<tbody>
<tr>
<td>To promote and educate community on DHF awareness and prevention through media or other potential ways on local wisdom</td>
<td>Local health office, health center, local government, key persons in the community</td>
</tr>
<tr>
<td>To conduct community capacity building on DHF awareness and prevention</td>
<td>Local health office, health center, local government, key persons in the community</td>
</tr>
<tr>
<td>To support community participation on DHF awareness and prevention</td>
<td>Local health office, health center, local government</td>
</tr>
</tbody>
</table>
## What Should Do

<table>
<thead>
<tr>
<th>What Should Do</th>
<th>Stake Holders</th>
</tr>
</thead>
<tbody>
<tr>
<td>To conduct training on health promotion &amp; education among health officers</td>
<td>MOH, Univ., Local health office</td>
</tr>
<tr>
<td>To conduct training on health community development among health officers</td>
<td>Univ., Local health office</td>
</tr>
<tr>
<td>To evaluate &amp; revitalize DHF eradication program</td>
<td>MOH, Local health office</td>
</tr>
<tr>
<td>To implement the revised program &amp; supervise frequently</td>
<td>Local health office, MOH</td>
</tr>
<tr>
<td>To provide appropriate budget</td>
<td>MOH, Local health office, Local government</td>
</tr>
</tbody>
</table>
# ADVOCACY, CAPACITY BUILDING, POLITICAL AWARENESS

<table>
<thead>
<tr>
<th>WHAT SHOULD DO</th>
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</tr>
</thead>
<tbody>
<tr>
<td>To conduct meeting/workshop on DHF eradication ideas for MOH high level positions</td>
<td>University</td>
</tr>
<tr>
<td>To conduct seminar/workshop on DHF current research &amp; prevention for MOH</td>
<td>University</td>
</tr>
<tr>
<td>To conduct public hearing/seminar on current status of DHF &amp; its prevention for politicians/parties</td>
<td>University</td>
</tr>
</tbody>
</table>
PROBLEM
Rising incidence of DHF in Indonesia

EFFECTS
Risk of spread

IMPACTS
Reduce productivity

OUTCOME
Difficult to be tackled

Morbidity
Indonesia

Mortality
International

Increase absenteeism
Fear in Community

Threat tourism
Putting more people at risk worldwide
STAKE HOLDERS RELEVANT TO THE EFFECTS

- DHF patients
- General population
- Tourists
- Neighborhood countries
ORGANISATIONAL STRUCTURE

MOH & University charts
ORGANISATIONAL STRUCTURE

Provincial & city government with health office charts
POWER ousse POWER+INTEREST?

- **HIGH**
  - 1. MOH/DG of CDC&EH
  - 2. Local government
  - 3. Local health office/health center
  - 4. BMKG

- **POWER**

- **LOW**

- **INTEREST**

- **HIGH**

1. University
2. Key persons in the community
3. Media/Journal

Community
GOAL

The policy brief adopted by the Indonesia Ministry of Health

OBJECTIVES:

• Adopt an evidence-based solution
• Develop innovative or solution-oriented research agenda
• Strengthen capacity of public health practitioner and professional
• Strengthen knowledge & awareness of academician & public
<table>
<thead>
<tr>
<th>OBJECTIVE</th>
<th>ACTION PLAN</th>
<th>TARGETED STAKE HOLDERS</th>
<th>INDICATORS</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adopt an evidence-based solution</td>
<td>To discuss the policy brief approach with the decision makers on a personal meeting</td>
<td>Dit of Env. Health MOH Dit of Animal Diseases MOH RC for Health Ecology MOH Center for CC &amp; Air Pollution MCGA</td>
<td>Decision makers adopt &amp; commit to the approach</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td>To share the policy brief approach on the development of national CC health adaptation process</td>
<td>Dit of Env. Health MOH</td>
<td>The team accept &amp; utilize the approach</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td>To disseminate the policy brief approach to potential staff working on CC health adaptation</td>
<td>Dit of Env. Health MOH Dit of Animal Diseases MOH RC for Health Ecology MOH</td>
<td>The potential staffs understand the policy brief approach</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td>To advocate a specific decision maker to adapt policy brief approach for other animal diseases related to CC</td>
<td>Dit of Animal Diseases MOH</td>
<td>The policy brief approach adapted by Dit of Animal Diseases MOH</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td>To advocate decision makers on the important to develop Early Warning System on climate related diseases</td>
<td>Dit of Env. Health MOH MCGA Local Health Office</td>
<td>The MOU of collaboration Early Warning System signed</td>
<td>2010</td>
</tr>
<tr>
<td>OBJECTIVES</td>
<td>ACTION PLAN</td>
<td>TARGETED STAKE HOLDERS</td>
<td>INDICATORS</td>
<td>TIME</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
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<td>-------</td>
</tr>
<tr>
<td>Develop innovative or solution-oriented research agenda</td>
<td>To suggest potential research for verifying &amp; eradicating DHF causes or other possible CC-related illnesses</td>
<td>RC for Health Ecology MOH Center for CC &amp; Air Pollution MCGA Academicians at SPH UI &amp; RCC UI</td>
<td>More research proposals are developed among institutions</td>
<td>2011</td>
</tr>
<tr>
<td>To advocate of sharing data support for research on DHF causes and or other possible CC-related illnesses to decision maker</td>
<td></td>
<td>DG of MCGA</td>
<td>MCGA shared climate data to MOH &amp; Universities</td>
<td>2010</td>
</tr>
<tr>
<td>To share research focus &amp; methods on the development of collaboration research on CC and DHF, Malaria, Diarrhea</td>
<td></td>
<td>Center for CC &amp; Air Pollution MCGA</td>
<td>The team accepted the research focus &amp; methods</td>
<td>2010</td>
</tr>
</tbody>
</table>
### OBJECTIVE #3

<table>
<thead>
<tr>
<th>OBJECTIVE</th>
<th>ACTION PLAN</th>
<th>TARGETED STAKE HOLDERS</th>
<th>INDICATORS</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strengthen capacity of public health practitioner and professional</td>
<td>To present modification of policy brief on the ongoing CC health adaptation training of MOH</td>
<td>Dit of Env. Health MOH Public health practitioner &amp; professional</td>
<td>Public health practitioner &amp; professional accept the approach</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td>To adopt the bridging research-policy divide to train the trainer for capacity building</td>
<td>Decision makers PH professionals Academics</td>
<td>The training of trainer conducted at the University of Indonesia</td>
<td>2011</td>
</tr>
</tbody>
</table>
### OBJECTIVE #4

<table>
<thead>
<tr>
<th>OBJECTIVE</th>
<th>ACTION PLAN</th>
<th>TARGETED STAKE HOLDERS</th>
<th>INDICATORS</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strengthen knowledge &amp; awareness of academician &amp; public</td>
<td>To rewrite the policy brief into a scientific article to publish on an international journal</td>
<td>Academicians, Students</td>
<td>Published by international journal</td>
<td>2011</td>
</tr>
<tr>
<td></td>
<td>To rewrite the policy brief into a popular article and to publish on a media</td>
<td>Community, Decision makers, Politicians</td>
<td>Published by national media</td>
<td>2010</td>
</tr>
</tbody>
</table>
POTENTIAL BARRIERS

- A few number of research available due to limited number researcher interested in the issue.
- Advocating and influencing policy makers