

Wastewater Management Expert system

"WaMEx"

Zoran Vojinovic

UNESCO-IHE, Institute for Water Education,
Delft, The Netherlands

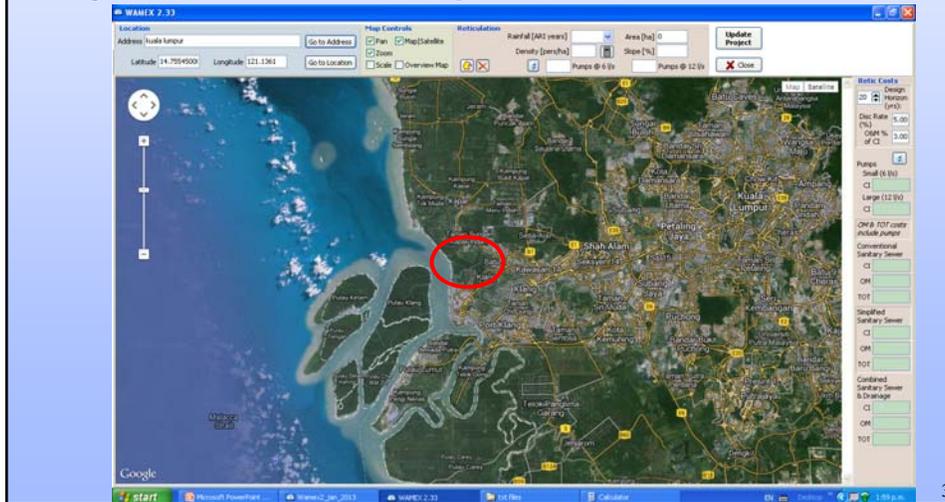
1

CASE STUDY WORK: Kuala Lumpur, Malaysia



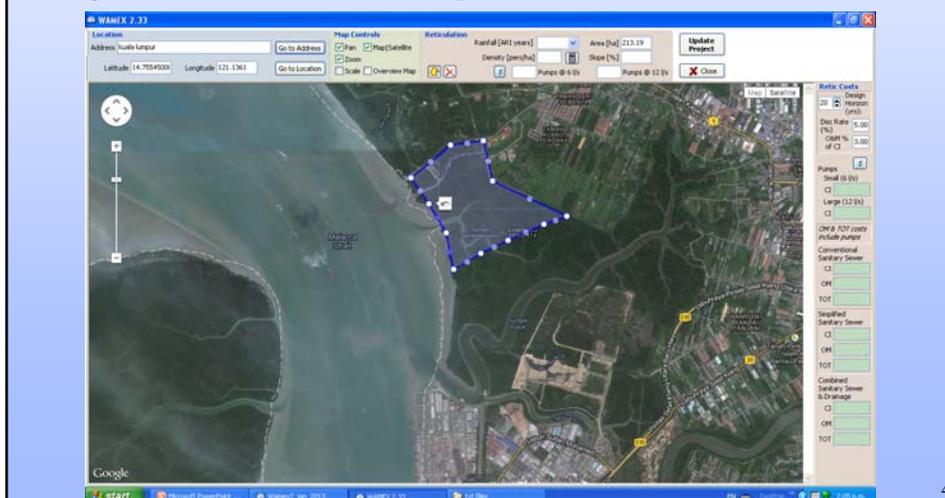
CASE STUDY 1: Wastewater Technology Selection Module

Government is planning to develop a new urban area in Malaysia (KL): 213 Hectares Population: 10,000



CASE STUDY 1: Wastewater Technology Selection Module

Government is planning to develop a new urban area in Malaysia (KL): 213 Hectares Population: 10,000



CASE STUDY 1: Wastewater Technology Selection Module

Step 1: set up a new project!

Urban area in Malaysia (KL): 213 Hectares

Population: 10,000

Design Horizon: 20 years;

O&M as % of CI: 3%;

Discount Rate: 5%

5

CASE STUDY 1: Wastewater Technology Selection Module

Step 2: define WW characteristics!

Wastewater source/characterisation options considered:

Sanitary Sewerage 100 l/p/d, 550, 100, 60, 5, 200

20

6

CASE STUDY 1: Wastewater Technology Selection Module

Step 3: evaluate technology options!

Factors for consideration of technology options:

- 1: Efficiency (Coliform Removal, Sludge Generation),
- 2: Shock Resistance (Flow, Toxicity),
- 3: Economy (Energy);

Try different combinations of weights in order to check "sensitivity" of technologies;

7

CASE STUDY 1: Wastewater Technology Selection Module

Step 4: Evaluate new scenario!

Government may adopt Singaporean Stds in the future

Design Horizon: 20 years;

O&M as % of CI: 3%;

Discount Rate: 5%

Factors for consideration of technology options:

- 1: Efficiency (Coliform Removal, Sludge Generation),
- 2: Shock Resistance (Flow, Toxicity),
- 3: Economy (Energy);

Try different combinations of weights in order to check "sensitivity" of technologies;

6

8

CASE STUDY 1: Wastewater Technology Selection Module

Step 5: Analyse results!

Compare the results from both options

9

CASE STUDY 1: Wastewater Technology Selection Module

Step 6: Answer the question below!

Which technology options would you recommend?

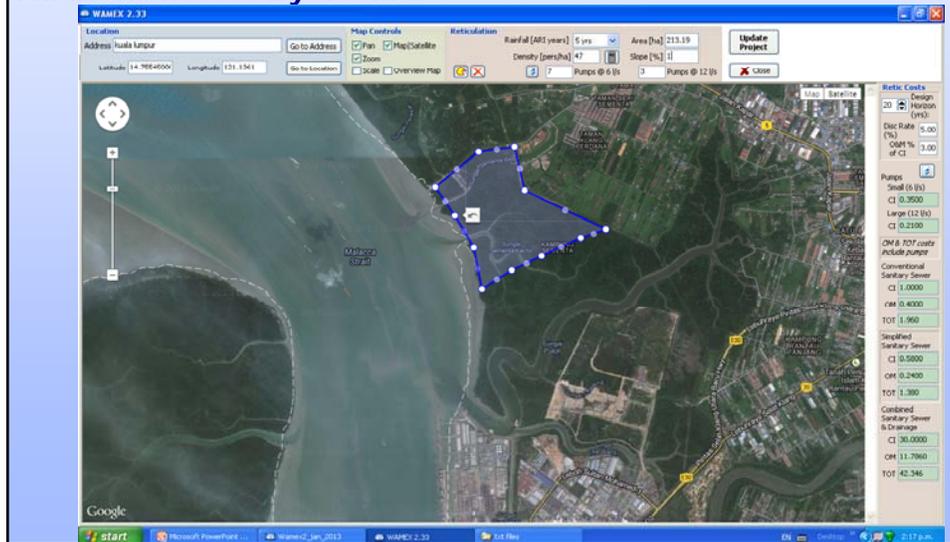
Discuss the results within the group

10

CASE STUDY 1: Reticulation Selection Module

Step 7

Fill in the necessary details:



CASE STUDY 1: Reticulation Selection Module

Step 7

Fill in the necessary details:

Terrain slope: 1%
Design Horizon: 50 years;
O&M as % of CI: 2%;
Discount Rate: 5%

CASE STUDY 1: Reticulation Selection Module

Step 8

Calculate costs of three sewer options (costs are in USD Million):

- Conventional sanitary sewer
- Simplified sanitary sewer
- Combined Sanitary Sewer and Drainage

13

CASE STUDY 1: Both Modules

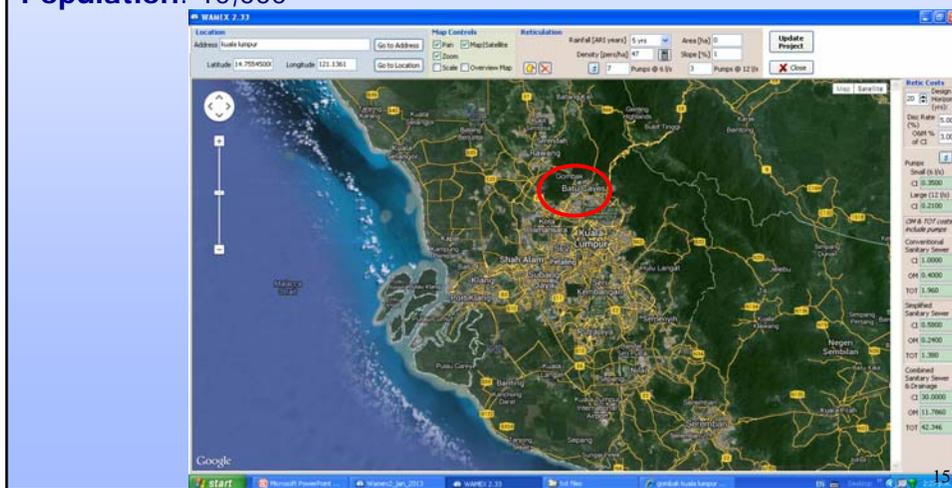
Step 9

Add up all costs (i.e., treatment + reticulation) and discuss the findings within your group and present the conclusions!

14

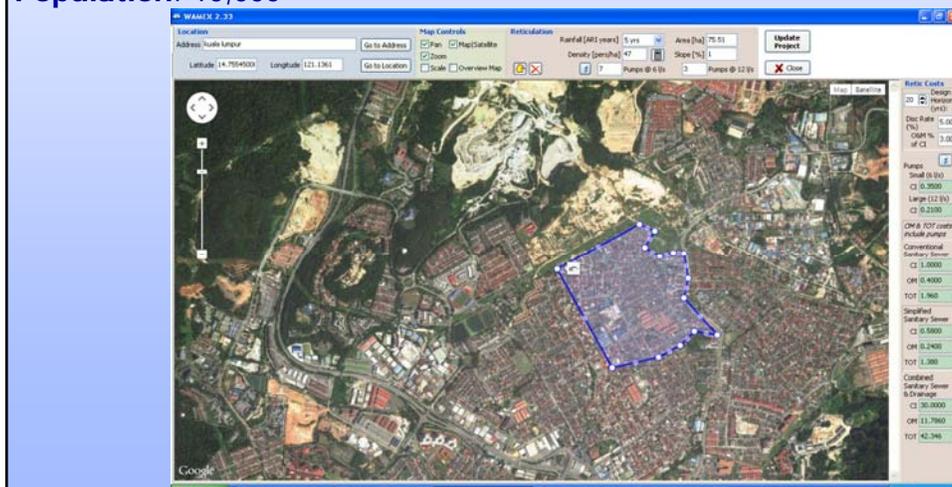
CASE STUDY 2: Wastewater Technology Selection Module

Government is planning to upgrade the WW system in the existing Batu Caves area in Malaysia (KL): 75 Hectares
Population: 10,000



CASE STUDY 2: Wastewater Technology Selection Module

Government is planning to upgrade the WW system in the existing Batu Caves area in Malaysia (KL): 75 Hectares
Population: 10,000



CASE STUDY 2: Wastewater Technology Selection Module

Step 1: set up a new project!

Urban area in Malaysia (KL): 75 Hectares

Population: 10,000

Design Horizon: 20 years;

O&M as % of CI: 3%;

Discount Rate: 5%

17

CASE STUDY 2: Wastewater Technology Selection Module

Step 2: define WW characteristics!

Wastewater source/characterisation options considered:

Group a) Sanitary Sewerage 100 l/p/d, 550, 100, 60, 5, 200

Group b) Black Water 150 l/p/d, 200, 100, 200, 5, 0

Group c) Combined Sewage 200 l/p/d, 400, 200, 20, 2, 30

20, 35, 33

18

CASE STUDY 2: Wastewater Technology Selection Module

Step 3: evaluate technology options!

Factors for consideration of technology options:

- 1: Efficiency (Coliform Removal, Sludge Generation),
- 2: Shock Resistance (Flow, Toxicity),
- 3: Economy (Energy);

Try different combinations of weights in order to check "sensitivity" of technologies;

19

CASE STUDY 2: Wastewater Technology Selection Module

Step 4: Evaluate new scenario!

Government may adopt Singaporean Stds in the future

Design Horizon: 20 years;

O&M as % of CI: 3%;

Discount Rate: 5%

Factors for consideration of technology options:

- 1: Efficiency (Coliform Removal, Sludge Generation),
- 2: Shock Resistance (Flow, Toxicity),
- 3: Economy (Energy);

Try different combinations of weights in order to check "sensitivity" of technologies;

6, 8, 13

20

CASE STUDY 2: Wastewater Technology Selection Module

Step 5

Set up a new standard – assume values between Malaysian and Singaporean standards (database entry)

Evaluate technology options for the new standard

Discuss the results

21

CASE STUDY 2: Wastewater Technology Selection Module

Step 6: Analyse results!

Compare the results from all three options

22

CASE STUDY 2: Wastewater Technology Selection Module

Step 7: Answer the question below!

Which technology options would you recommend?

Discuss the results within the group

23

CASE STUDY 2: Reticulation Selection Module

Step 7

Fill in the necessary details:

The screenshot displays the WAREX 2.33 software interface. The main window shows a satellite map of Kuala Lumpur with a blue polygon highlighting a specific area. The interface includes several input fields and controls:

- Location:** Kuala Lumpur
- Address:** Kuala Lumpur
- Map Controls:** Pan, Map/Satellite, Zoom, Scale, Overview Map
- Reticulation:** Rainfall [60] years: 5 yrs, Area [ha]: 75.51, Density [pop/ha]: 47, Slope [%]: 1
- Update Project:** Button
- Close:** Button

On the right side, there is a list of technology options with their respective costs:

Technology	Cost
Design	
Horizon (yr):	
Disc Rate (%)	5.00
O&M % of CI	3.00
Pumps	
Small (6 1/2")	
CI @ 3000	
Large (12 1/2")	
CI @ 2100	
CI @ 1000	
CI @ 4000	
TOT 1.960	
Simplified Sanitary Sewer	
CI @ 5000	
CI @ 2400	
TOT 1.380	
Combined Sanitary Sewer & Drainage	
CI @ 30.0000	
CI @ 11.7660	
TOT 42.546	

The Windows taskbar at the bottom shows the Start button, several open applications (Microsoft PowerPoint, WAREX_2M_2013, WAREX 2.33, Notepad), and the system tray with the date and time (2/21/2013, 12:28 pm).

24

CASE STUDY 2: Reticulation Selection Module

Step 7

Fill in the necessary details:

Terrain slope: 1%
Design Horizon: 50 years;
O&M as % of CI: 2%;
Discount Rate: 5%

25

CASE STUDY 2: Reticulation Selection Module

Step 8: Measurements

Approximate development calculation:

The screenshot shows the WAREX 2.33 software interface. A 'Density Calculator' dialog box is open over a satellite map of a residential area. The dialog box contains the following information:

- Area (ha): 2.05
- Dwellings (No.): 44
- Pers./Dwelling: 8
- Density (Pers/ha): 172

The software interface also displays various project parameters on the right side, including:

- Design Horizon: 50 years
- Disc Rate: 5.00%
- O&M % of CI: 3.00%
- Pumps: Small (6 1/2"), Large (12 1/2")
- GM & TOT costs: Conventional Sanitary Sewer, Simplified Sanitary Sewer, Combined Sanitary Sewer & Drainage

26

CASE STUDY 2: Reticulation Selection Module

Step 9

Calculate costs of three sewer options (costs are in USD Million):

- Conventional sanitary sewer
- Simplified sanitary sewer
- Combined Sanitary Sewer and Drainage

27

CASE STUDY 2: Both Modules

Step 10

Add up all costs (i.e., treatment + reticulation) and discuss the findings within your group and present the conclusions!

28

Thank you for your attention!

