

APPLICATION OF DECISION SUPPORT SYSTEM TO SUSTAINABLE LOWLAND PLANNING AND MANAGEMENT IN YUNLIN AREA, TAIWAN

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Why this study?

- ✓ The needs of the sustainable approaches for planning and managing landscapes are increasingly recognized.
- ✓ The study evaluated the possible consequences of different scenarios to highlight the most conflicting sites and to propose an optimal strategy.



Flooding



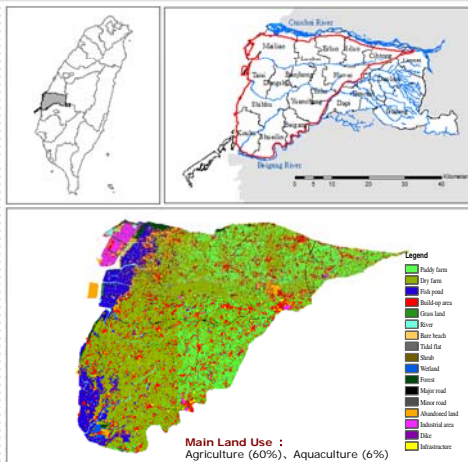
Land Subsidence

Outline

- Study Area
- Decision Support System
- Scenario Design
- Results
- Conclusion

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Study Area



The low-lying area in Yunlin between Cuoshui River and Beigang River with the areas of 843 km² (NLSMC, 2008).

- ◆ Land subsidence is serious due to groundwater over-pumping
- ◆ The topography of the area is low and its ground slope is flat
- ◆ Flood-prone and demonstration area (WRA)

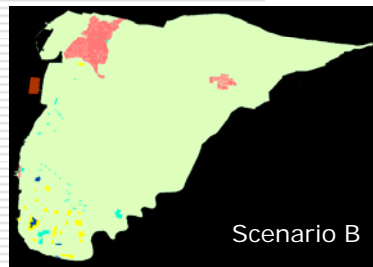
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Scenario Design

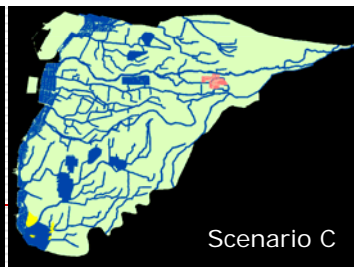


Scenario A

Scenario	Description	Measures
A (Do nothing)	To reflect the possible outcome under current situation.	None
B (Yulin County Comprehensive Development Plan and Regulation Project of Flood-prone Areas)	To represent the national policy.	<ol style="list-style-type: none"> 1. Development of New Maliao City for 31.88 km² and Formosa offshore park for 2.8 km² 2. Dike protection on 23 villages in a total area for about 8.6 km², including Houanliao, Wengang, Cinghan, Dngkouhu villages, etc. 3. Detention pond construction with an area of 3.5 km².
C (Coastal Conservation Green Way)	To reflect the possible outcome by transforming vulnerable area to other uses.	<ol style="list-style-type: none"> 1. Room for water in coastal area and 100-meter buffer along river channel. 2. Area about 13.6 km² preserved under the national planning policy act for wetlands or conservation greenway. 3. The existed dike protection on Chenglong, Hukou, Iwu and Shueijing village.



Scenario B

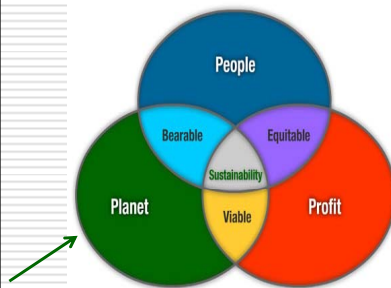


Scenario C

- Legend**
- Wetland
 - Detention pond
 - New city
 - Low-lying village protection
 - Industrial area
 - Remain

Application of Sustainability Indicators

Three-pillar or triple bottom line (TBL) as the sustainability.



Concept of Triple Bottom Line

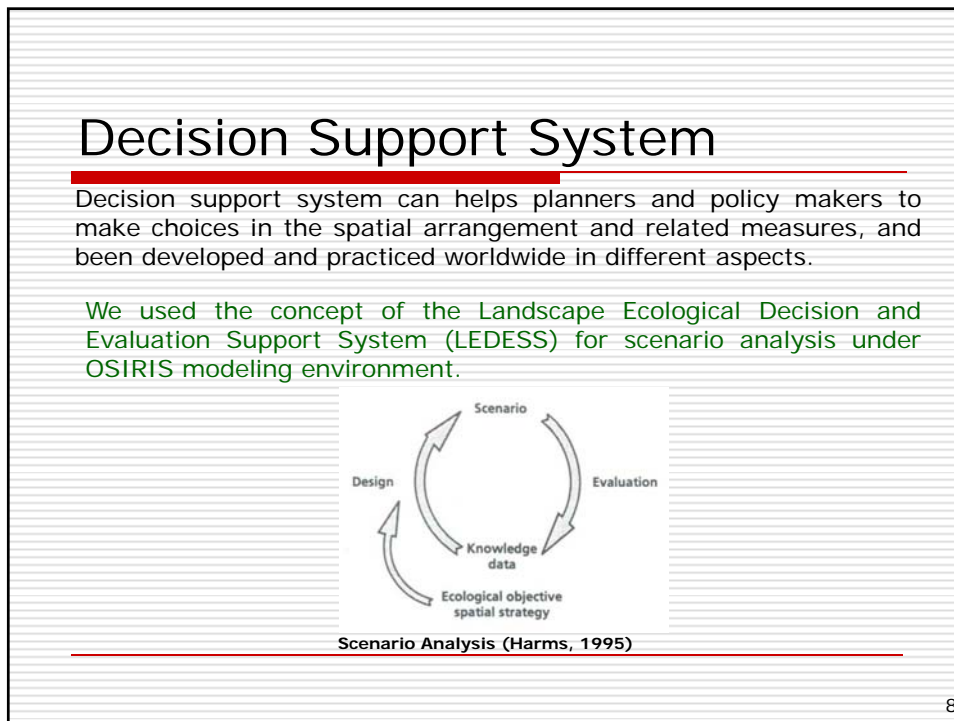
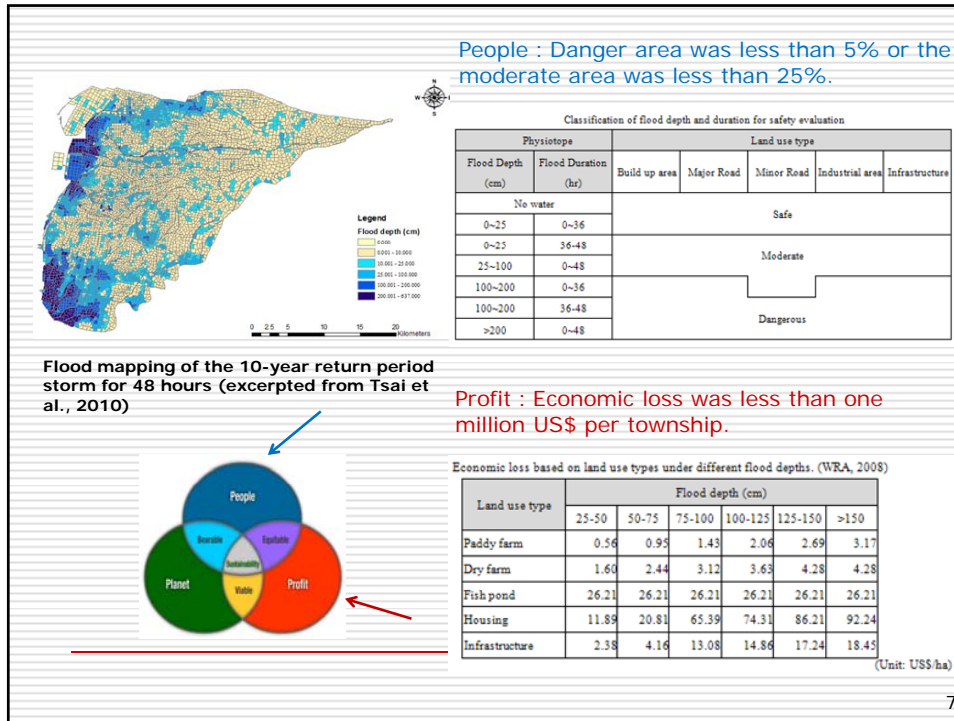
(http://www.greeninnovation.com.au/aboutGreeninnovation_sustainability.html)

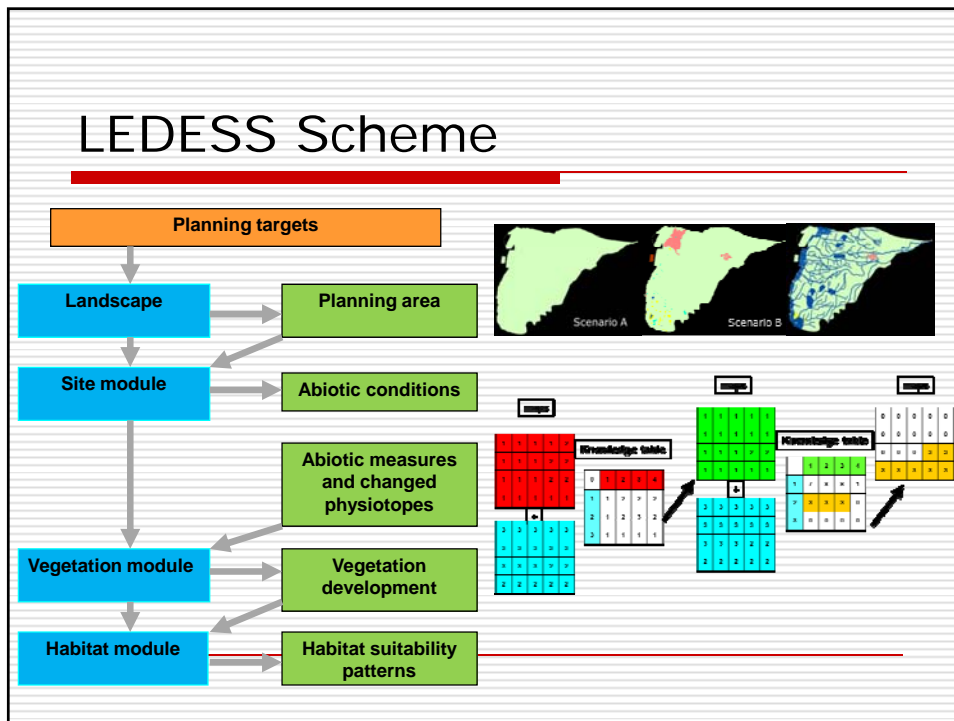
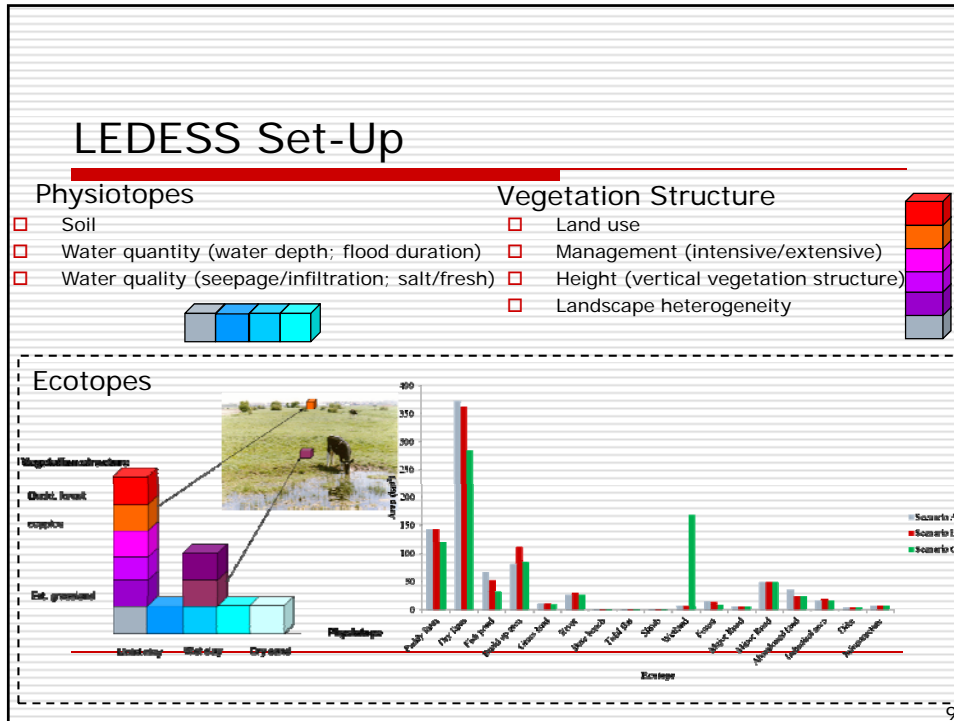
Planet : More than two key habitats was more than 20% of each township or area for more than three key habitats was more than 5%.

Habitat characteristics of the three selected species.

Land Cover	Birds	Black-winged stilt	Kentish plover	Painted snipe
Paddy farm	HM, F, R	HM, F, R	HM, F, R	HM, F, R
Dry farm	-	HL, F	-	-
Fish pond	HH, F	HL, F	-	-
Bare beach	-	HG, B, F, R	HL, F	-
Tidal flat	HM, F	HH, B, F, R	-	-
Wetland	HM, B, F, R	HM, B, F, R	HM, F, R	HM, F, R
Abandoned land	HG, B, F, R	HL, B, F, R	HM, B, F, R	HM, B, F, R
Forest; Road; Shrub; Build-up area; Grass; River; Dike	-	-	-	-
Spatial characteristics				
Max. home range distance (m)	250	333	75	-
Max. density (/km ²)	6	10	5	-
Population for key habitat	20	20	20	-

Note: HH = Habitat of high quality (carrying capacity = 1); HG = Habitat of good quality (carrying capacity = 0.75); HM = Habitat of medium quality (carrying capacity = 0.5); HL = Habitat of low quality (carrying capacity = 0.25); - = The species does not occur in this landcover type; F = Foraging habitat; B = Breeding habitat; R = Roosting habitat; - = not suitable (Data source: Michiel van Eupen, Personal communication)





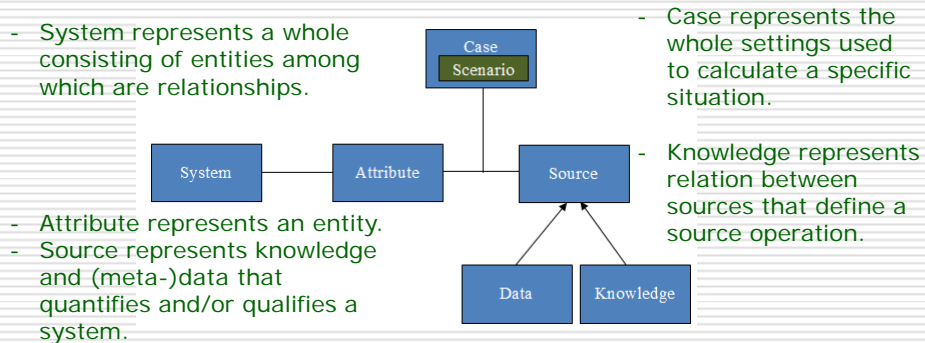
Organization of expert knowledge

- Tables
 - Rules
 - Maps
 - Databases
 - Descriptions
- The optimum habitat of the Reed Warbler is reed marsh without trees and managed by cutting the reed every year. Marginal habitat = reedmarsh with trees
 - IF vegetation = reedmarsh THEN habitat = optimal ELSE habitat = marginal

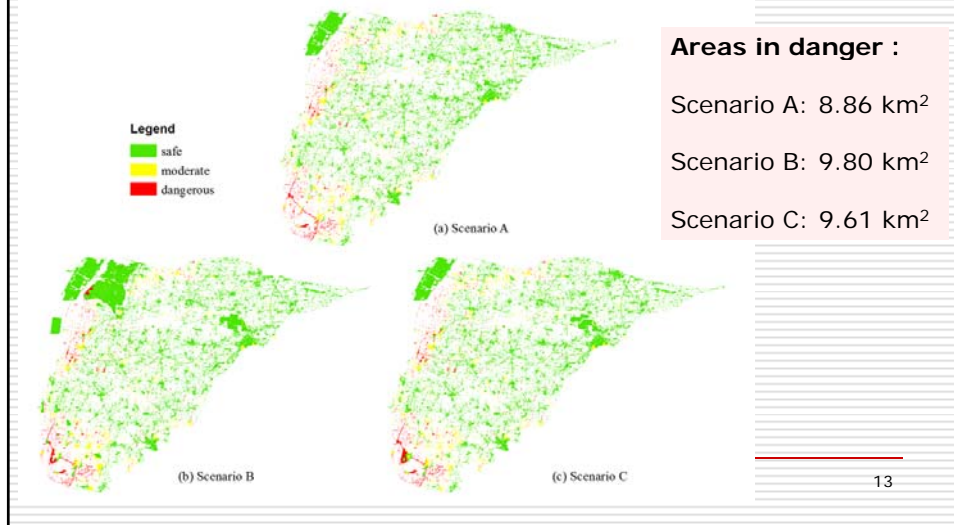
habitat Suitability	deep streaming water	shallow stagnant water	claysoil, 2-20 days flooded
water	0	0	0
open soil	0	0	0
pioneer vegetation	0	0	25
reed marsh	0	25	75
shrubs	0	25	25

OSIRIS System

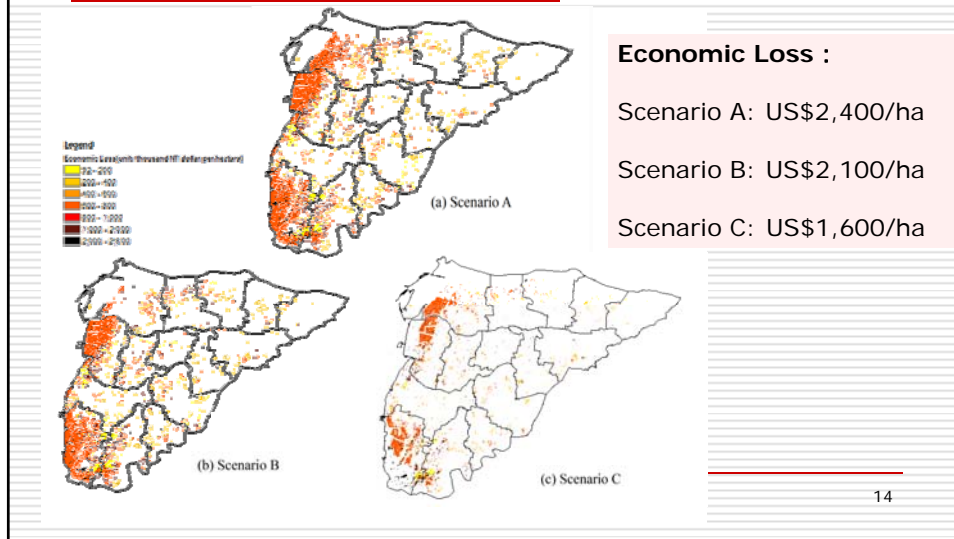
The OSIRIS system was developed by WISL, Wageningen Software Labs, enabling the linkage between GIS data and qualitative rules.

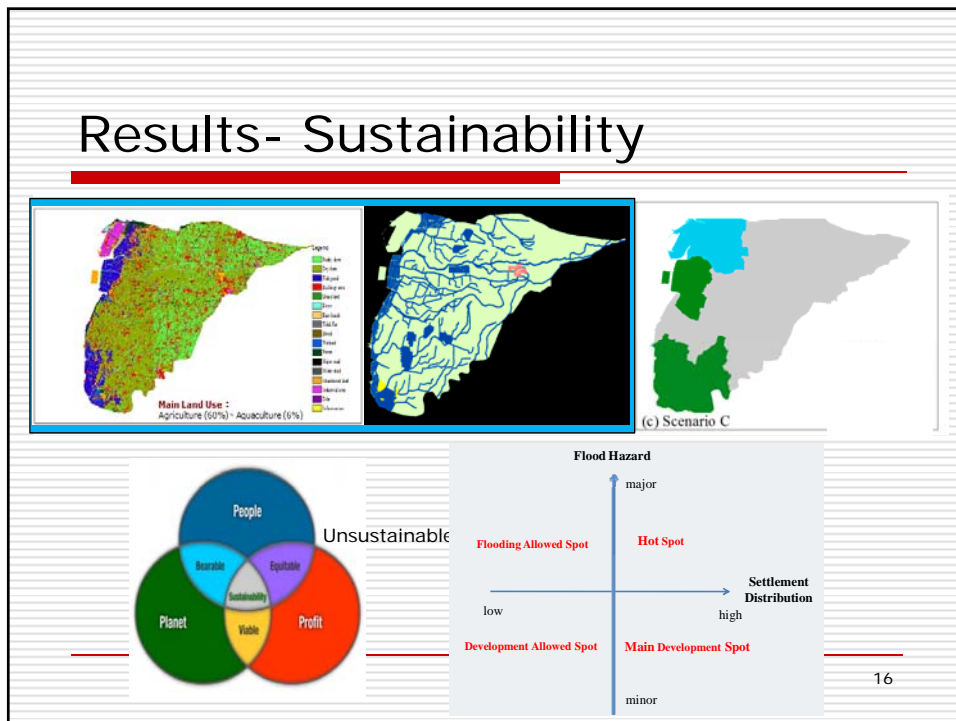
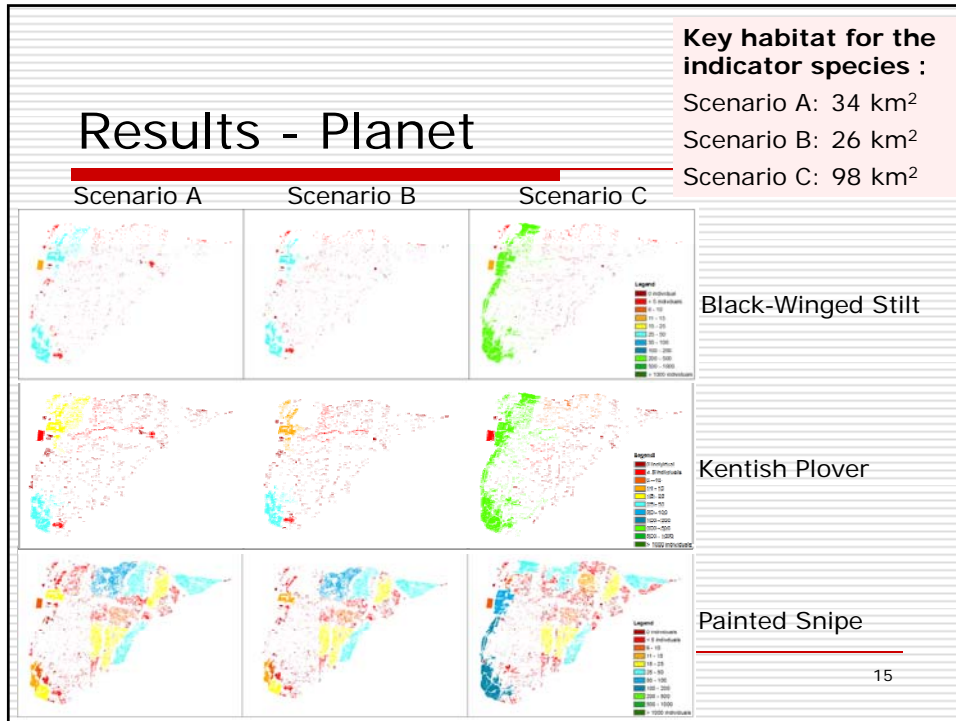


Results - People



Results - Profit





Conclusion

- ✓ The tool developed in this study can help quickly scan the impacts under different alternatives and to enhance communication between stakeholders and help achieve sustainable lowland management.
- ✓ In summary, the results indicated that the current policy would not be an effective and sustainable strategy of lowland planning and management in safety, economics and ecological concerns.
- ✓ We suggest more discussions on the indicators and thresholds for sustainable development in stakeholder-involved workshops or more public participation should be facilitated for more precise simulated results in future and help enhance the decision making.

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*~ Thanks for your attention
and all the reviewers' helping
comments ~*
