Expressing Sustainability within the Web-Based Multiplayer Game *Naranpur Online*

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Abstract:

Since the concept of sustainability is fairly abstract, it is often difficult to depict to others whether a region is undergoing sustainable development. One solution is to develop and visualize a system of metrics and indicators that measure the sustainability of a region. This can pose a challenge, as regions have differing aspects that indicate sustainable development, thus making it hard to develop universal indicators that can be applied across regions. *Naranpur Online*, an online multiplayer watershed management game, simulates an agricultural environment where players interact to impact the potential of a region to evolve as a "sustainable system." For this project, I have developed seven metrics, each containing several indicators, which will be able to determine the relative sustainable development of both the entire world of Naranpur and the individual player's farming property. These metrics are used within a "hierarchical metrics system," such that there are three tertiary metrics (economy, society, and environment), three secondary metrics (eco-economic, socio-environmental, and socio-economic), and one primary metric (eco-socio-economic), where the primary metric has priority over the other two metric types in assessing sustainable development. Being able to visualize sustainable development within Naranpur will facilitate a player's understanding of the concept of sustainability and how they themselves contribute to a more global sustainable development.

Research Question:

Are there visualization methods that can aid in the comprehension of the concept of sustainable development in *Naranpur Online*?

Objectives of *Naranpur Online*:

- Provide food, milk, and water essential for your family's survival
- Increase your family's net wealth by selling resources to other players as well as cashing crops to the bank.
- Make decisions that minimize environmental impact of your family operations.

Chosen definition for sustainable development:

- "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." –World Commission of Environment and Development

Hierarchical Metric System

Tertiary Metrics:

1. Environmental
1) Depth of Water
2) Irrigation
3) Fertilizer
4) Pesticide
5) Rainfall

2. Economic
6) Livestock
7) Livestock-Food Consumed
8) Livestock Labor Produced
9) Fertilizer Produced
10) Commodities Stored
11) Money
12) Rate of Store Transactions
13) Agricultural Inputs

3. Societal
14) World Population
15) Rate of Communication
16) Family Size
17) Family Age Distribution
18) Rate of Family Growth

Secondary Metrics:

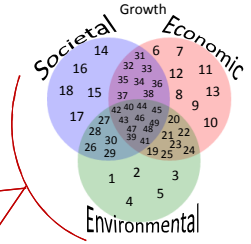
4. Eco-economic
19) Acres Used
20) Percent Crop
21) Land Percentage
22) Straw Produced Current Yield
23) Average Crop Progress
24) Collect Seed
25) Cotton Produced Current Yield

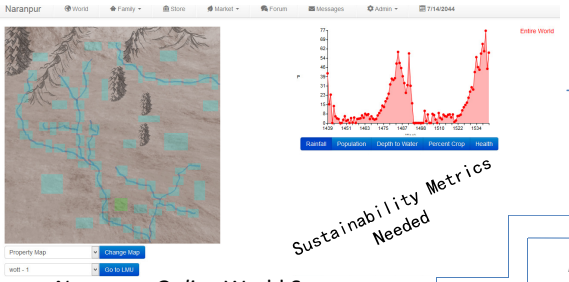
5. Socio-environmental
26) Human Waste
27) Contaminants
28) Water Quality
29) Water Collection Yield
30) Water Collecting FLUs

6. Socio-economic
31) Labor Efficiency
32) Water Stored
33) Grain Stored
34) Straw Stored
35) Milk Stored
36) Rate of Trading
37) Milk Produced
38) Labor Available

Primary Metric:

7. Eco-socio-economic
39) Water Use Efficiency
40) Grain Current Yield
41) Time to Water Depletion
42) Crop Health
43) Family Health
44) World Health
45) Time to Grain Depletion
46) Water Quality Depletion Rate
47) Rate of Human Waste Growth
48) Rate of Contaminant Growth
49) Rate of Economic Growth



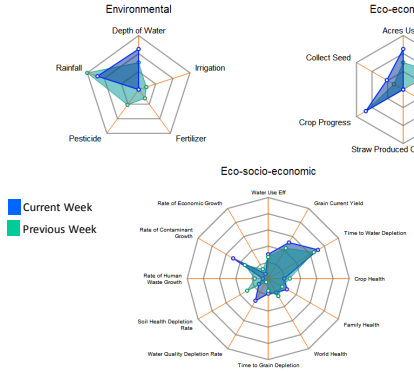


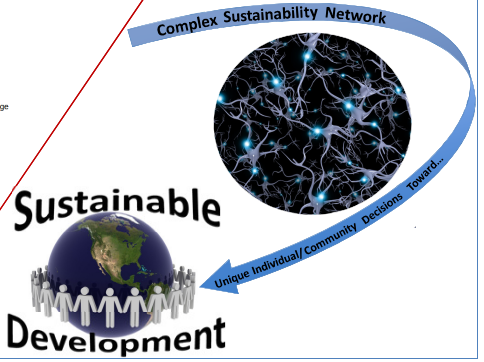
Naranpur Online World Screen

From Here…
- Analyze historical data
- See current status of the Naranpur world
- Trade resources with other families
- Comment on the Naranpur forum
- Buy/sell resources at the store

Naranpur Online L.M.U. Screen
(*Land Management Unit* Screen)

From Here…
- Manage and grow crops
- View family members/health
- Manage livestock
- Manage water collection methods
- View inventory and status of resources





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