

# **Intelligent Eco-Villages A Sustainable Path to Eradicate Extreme Poverty**

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# The Growing World Population

- In 2011, our planet's population was seven billion people
- The projected figure for 2045 – is nine billion people
- By 2045, 30 years from now, we will need 70% more food
- Today More than a billion people worldwide live in extreme poverty
- Nearly one-third of children in developing countries are underweight or stunted (low height for age)
- Undernutrition contributes to one-third of all child deaths
- Global climate change reduces the water available for farming each year

# **Intelligent Eco-Villages (IEV) a Holistic Solution**

- An Eco-Village is defined as an intentional or traditional community using local participatory processes to integrate ecological, economic, social, and cultural dimensions of sustainability in order to regenerate social and natural environments
- An IEV adds the necessary water, food, shelter, communications, and sensors to provide for distance learning, Telemedicine for both humans and livestock, as well as climatic and agricultural sensors that enable remote monitoring and advising on crop statuses.

# Intelligent Eco-Villages (IEV) a Holistic Solution Continued

- The Instrumented IEV will provide jobs and on the job training for the following:
  - Creating Immediate Jobs
    - Building out the various domes
    - Setting the domes up and maintaining the communications and infrastructure of the village systems
      - Solar power jobs and innovation
      - Water purification and plumbing jobs and innovation
  - Provide long term jobs supporting the grow domes
  - Providing educational resources
    - Education for children through 12<sup>th</sup> grade to include distance learning capabilities where the communication systems allow
    - Adult education in Sanitation, Agriculture, nutrition, power and water systems management
  - Providing critical healthcare resources including
    - Healthcare clinics setup for medical stability operations (i.e., Doctors without borders)
    - Telemedicine capabilities for Crisis response

# Intelligent Eco Village Concept



**Biochar Reactor**



**Vet Clinic**



**Well & Water Purification**



**Solar power Generator**



**Grow Dome**

**Video Cameras For Remote Monitoring**



**Remote Spectrum Monitoring**



**Outdoor Classroom**



**Threat Detection Sensors**



**Seismic Sensors**



**IR/Thermal Camera (PTZ)**

**WiFi Coverage**



# Grow Domes

- Plants grown in a field will often produce 2.5 pounds per square foot per year
- In a Monolithic Grow Dome those same plants will produce 200 to 300 pounds per square foot per year
- less than 10% of the water used to grow food outdoors is needed to grow it indoors
- Grow domes provide protection from inclement weather, and, with care, from insects, molds, and germs. Farmer and plant are protected from planting to harvest regardless of the weather

# Grow Domes Continued

- Large grow domes of 300+ ft. diameter
  - Can produce ~100million pounds/year of fresh organic fruits and vegetables
  - Enough produce to feed ~150,000 people.
- Small grow cabins have a production rate that can support small hamlets and villages of 50 -300 people
  - Easily maintained at a specific temperature
  - Utilized during the entire year
  - Requires minimum maintenance (i.e., cleaning and painting every few years)
  - Outfitted with trays to grow food hydroponically or in soil
  - fish can be grown on the ground floor of the grow dome as well as fowl such as the Pharaoh Quail or Guineas

# Shelter

- Monolithic concrete domes are the most cost effective shelters:
  - Monolithic domes are the most expensive (~60/sqft)
    - require the most equipment to build
    - are incredibly well insulated and require 75% less heating and cooling than traditional buildings
  - Ecoshell I, Ecoshell II's
    - are normally uninsulated but can have a limited amount of insulation added
    - Can be built by hand to sizes up to 40 ft in diameter
  - Monolithic gazebos can be built up to 40 feet in diameter
    - Provide excellent open air schools as well as outdoor kitchens in tropical environs.
  - The Ecoshells are very quick to build and cost effective costing approximately less than \$1,000 USD of materials to build the dome and another \$2,000-3000 to finish with appliances and furnishings (i.e., Doors, windows, sinks, and kitchens)



# Water

- Water purification can be very complex when trying to remove heavy metals and chemicals for large numbers of people in large cities.
- However for the developing countries that have limited or no prior water infrastructure there are a number of options ranging from
  - The simple but very effective Two bucket household systems
  - To Solar powered desalinization systems and filter systems capable of producing tens of thousands of gallons of pure water per day
- Each location will be assessed for water availability, usage to include a ten year forecast for growth
- Logistics is key to long term stability in the developing nations and selections of water systems will be managed to minimize replacement and repair parts and training.

# Sanitation

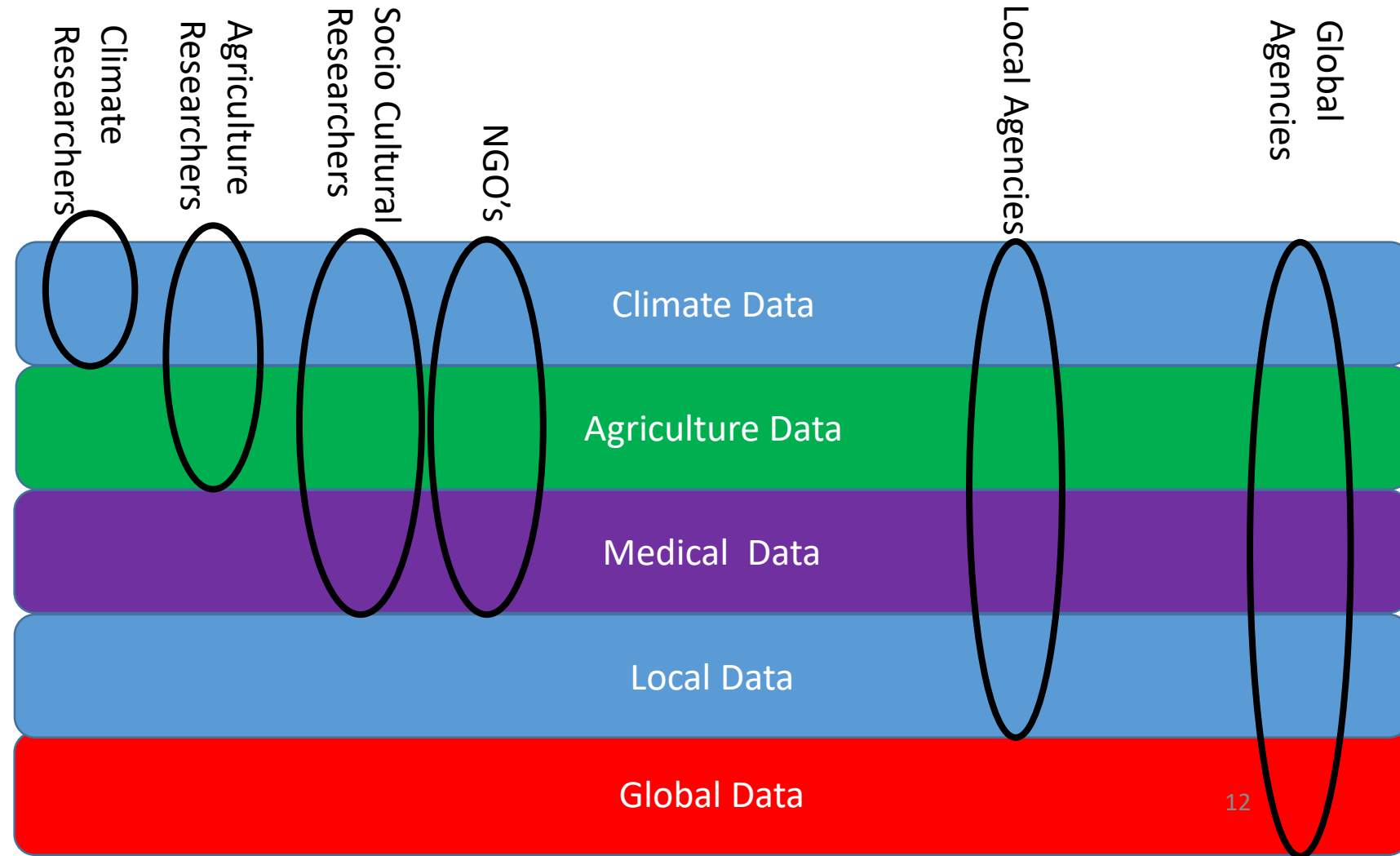
- Within the IEV we can take one of two approaches.
  1. Each home has a toilet and sink with segregated community bathing and laundry facilities
  2. Is for each home to have sink, toilet and bathing facilities with a community laundry facility.
- For toilets the intent is to use dry composting toilets to reduce water consumption and alleviate the need for complex septic/sewer systems

# Village Communications

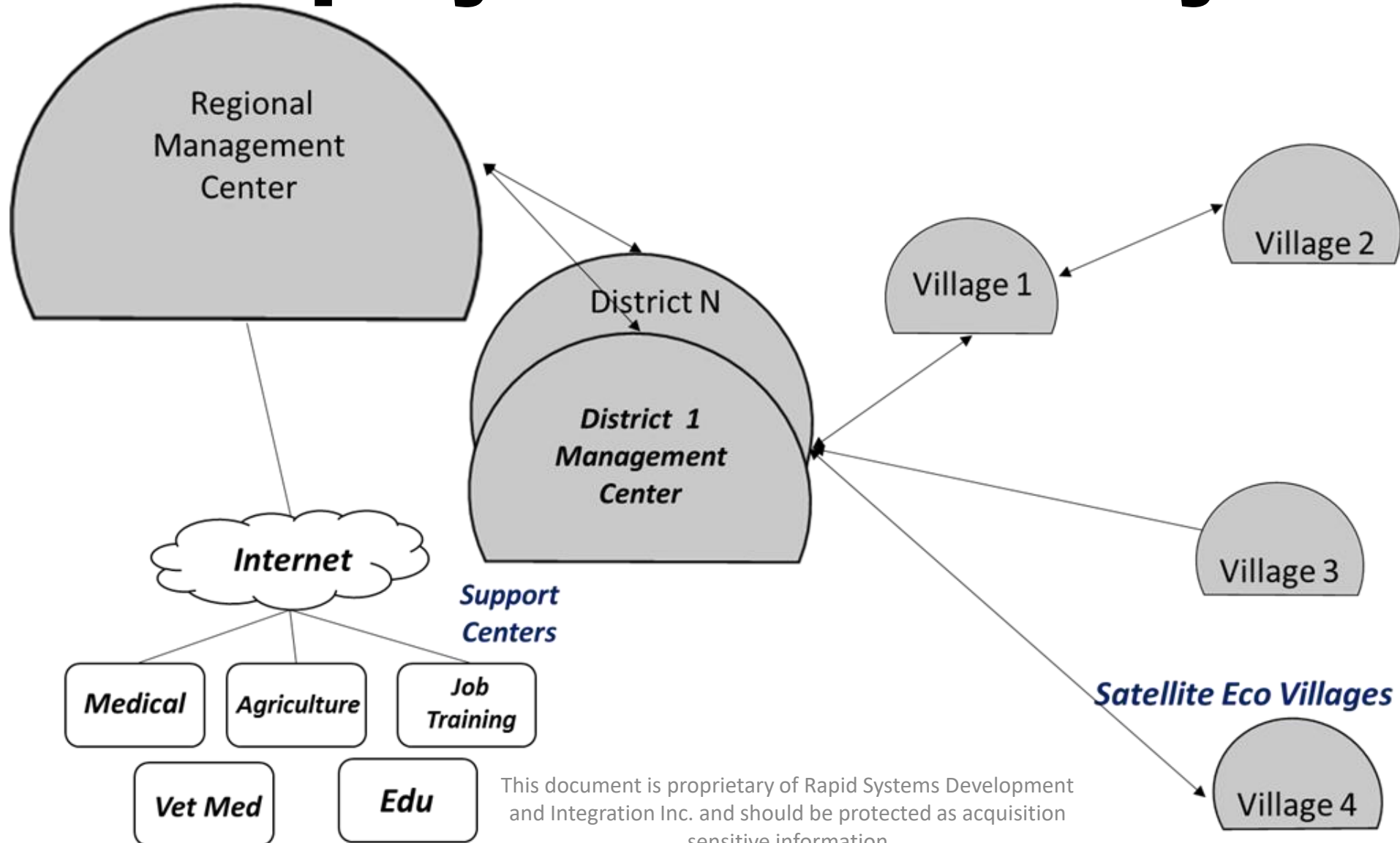
- The IEV communication concept is to provide two way communication capable of at a minimum supporting:
  - Education support via remote learning
  - Interactive adult learning E-Learning Sites for precision agriculture, irrigation instruction, trade and job training women's literacy
  - Interactive education
  - Agriculture information (weather data and soil sensor data)
  - Internet access
  - Local threat data
  - News
- With the rapid advances in the internet and the cellular communication industries it is now possible to provide Village wide Wi-Fi and Voice over Internet Protocol (VoIP) systems allowing villages to be able to communicate with others in local villages or in the world community.

# Horizontal Collaboration Environment

- Provides Near Real-Time data to All approved organizations
- Researchers and NGOs can work With the villages to prevent issues



# IEV Deployment Hierarchy



# IEV Deployment Hierarchy Continued

## Regional Management Center

- Strategically sited For Communications to Districts
- Large hospital and education facility
  - May include support village and infrastructure for staff
  - Optional garage for PEAK +trailers and prime movers supporting staff travels to districts
- Micro wave links to District/Satellite villages Includes tower
- High bandwidth connection to Internet
- Large grow Dome facilities sized for 1.5x local population
  - Provide education on maintaining and running grow domes
  - Maintains traveling staff to manage the regions IEVs
- E-learning capacities for Class rooms supporting
  - K-12 Education
  - Adult education
  - Health and sanitation
  - Agriculture
  - Vocational training
- Large Scale Sanitation facilities
  - Water purification
  - Toilet/shower

## District Center

- Large Healthcare clinic with full time staff and education facility
  - May include support village and infrastructure for staff
  - Optional garage for prime movers supporting staff travels to satellite villages
- Micro wave links to Regional and Satellite villages Includes tower
- High bandwidth connection to Internet
- Intermediate grow Dome facilities sized for 1.5 x expected local population
  - Provide education on maintaining and running grow domes
  - Maintains traveling staff to maintain all IEV in the district
- Schools with E-learning capacities for Class rooms supporting
  - K-12 Education
  - Adult education
  - Health and sanitation
  - Agriculture
  - Vocational training
- Large Scale Sanitation facilities
  - Water purification
  - Toilet/shower

# IEV Deployment Hierarchy Continued

## Satellite Eco-Village

- Satellite villages
  - Basic medical clinic for visiting medical teams with Telemedicine capabilities
  - basic grow Dome facilities sized for 1.5 x expected population
  - School
    - E-learning capacities/ Class rooms supporting
    - K-12 Education
    - Adult education
    - Health and sanitation
    - Agriculture
    - Vocational training
  - Sanitation facilities
    - Water purification
    - Toilet/shower

## Eco-Hamlet

- Satellite villages
  - Basic grow Dome facilities sized for expected population
  - School/medical clinic for visiting medical teams with Telemedicine capabilities
    - E-learning capacities/ Class rooms supporting
    - K-12 Education
    - Adult education
    - Health and sanitation
    - Agriculture
    - Vocational training
  - Sanitation facilities
    - Water purification
    - Toilet/shower

# Conclusion

- Currently More than a Billion people worldwide still live in extreme poverty
- IEV deployments provide a real lasting solution
- We are in a race against global climate change and growing world populations requiring more food and water
- IEVs with grow domes provide 2 orders of magnitude more food while using 90% less water than conventional farming
- A properly integrated IEV deployment provides education and training enabling sustainable food and water security to all communities and enables people in extreme poverty to rise up and become members of the market economy