Adapting to a Hotter, Drier World

Systems Workshop 2006
Institute of Design, IIT
Understanding
Adapting to a Hotter, Drier World

Understanding

Organization

Managing Tools

Policy Solutions

Agriculture Solutions

Emergency Planning

Adapting Methods

ProficientFlow

StandardFit

KTM center

= Site field researchers

Adapting to a Hotter, Drier World
KTM (Knowledge + Talent Management Center)

- Strategists identify resource needs and constraints, then analyze impacts, adoption rates and development strategies.
- Think Tank facilitates project analysis, engaging a network of outside thinkers to address the most difficult challenges.
- iHD Messenger is a web-based project management software.

Thought Leadership & Experts

Strategists and process evaluators

Think Tank

ProficientFlow software

Executives

Project Manager

Employees

Globally dispersed
Site field researchers

Aligned Partners & Agencies

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Online/offline project management and time tracking solution

- Increases KTM's project workflow, managerial effectiveness and individual accountability
- Provides varying degrees of software assistance along the chain of command

Employees:
- Effective way of receiving task related information from production manager
- Easy access to information pertaining to allocated tasks

Researchers:
- Overview of timeline for various tasks and projects
- Sends task-related information to project managers

Executives
- Visualized historical data for any particular project
- Overview of current work without being actively involved in projects

Project Managers
- Up to date access to changes and information
- Efficient delegation of work to appropriate employees

Allied Partners
- Access to project information anywhere
- Ability to upload project related files
EvaluWidget

- Manages multiple projects simultaneously
- Pools data from predetermined regions into a singular source
- Generates graphs and charts to visualize project history
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For **globally dispersed** field researchers requiring a means to **standardize** and **guide** the **data collection** process, **StandardFit** will communicate **detailed instructions** while they are in the field, and serve as a means to transmit data readings to a central data base at the **KTM** center.
StandardFit

- Standardizes data collection and result criteria
- Communicates via satellite to KTM regional headquarters
- Provides real-time updates through transmitting devices anchored in specific zones
StandardFit

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- Standardizes data collection and result criteria

**GROUNDWATER**

1. Obtain 50 ml sample
2. Apply test strip
3. Remove after 15 min.

**Water Quality**
- Air Quality
- Climate Assessment
- Waste Generation

**Groundwater**
- Drinking Water
- Surface Water

**Depth Meter**

**StandardFit**
- Password:
- Location:
- Temperature:
- Date:

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Understanding
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Evolution of Global Water Use
Withdrawal and Consumption by Sector

- Agricultural
- Domestic
- Industrial

UNESCO, 1999
Today approximately 3% of the world’s water is used by industry, 4% by the domestic sector, and 93% by the agricultural sector.
For **agricultural sector landowners** who may or may not be utilizing their water resources toward **appropriate crops**, **TradeRights** will provide **prioritization of water allocation** to farmers demonstrating best practices, and a comprehensive list of alternatives for those who do not, with **policy regulations** that offer **clear guidelines** and promote trading of water rights.
Severe Drought Threat

- Designates drought-sensitive regions
- Provides security to efficient zoned agricultural sectors
- Places barriers for inefficient sector development during drought
- Alleviates government role in monitoring water usage per agricultural sector
M-Soft

- Models soil moisture content to guide policy-making for **Priority Plan**
- Streaming imagery driven by data generated from KTM database combined with satellite water scanning technology
Streamflow priorities are owned by landowners (usually farmers) nearest the water source.
Streamflow priorities are owned by landowners (predominantly farmers) nearest the water source.

Outlying cities without sufficient water require large reservoirs.
- Trading farmers’ irrigation rights to provide more for non-agriculture uses reduces crop yields.

- Increase in streamflow for non-agricultural sector reduces reservoir size requirements.

- Savings in reservoir construction and maintenance offset cost of subsidizing crop differential.

See appendix for case study: Water Resource Bull.
More than **70%** of earth’s dryland is affected by desertification.
Once the world's 4th largest lake, providing for 60,000 people

Today 20 of 24 native fish species extinct

Economy once exported fish -- now importing fish and shifted exports to cotton
SolarFarms

- Once the world’s 4th largest lake, providing for 60,000 people
- Today 20 of 24 native fish species extinct
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![Bar chart showing water usage](chart.png)

- Total Central Asian Offtake: 117.7
- Groundwater: 11.4
- Return Water: 6.0
- Used for Regional Irrigation: 108.4
- Industry and Public Service: 9.3
SolarFarms

- Once the world's 4th largest lake, providing for 60,000 people
- Today 20 of 24 native fish species extinct
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![Bar chart showing water use breakdown]

- Total Central Asian Offtake: 117.7 Q/Km³
- Groundwater: 11.4 Q/Km³
- Return Water: 6.0 Q/Km³
- Used for Regional Irrigation: 108.4 Q/Km³ (92%)
- Industry and Public Service: 9.3 Q/Km³

Solar Farms = 92%
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- Average summer temperatures in the region fluctuate between 95-115 °F
- If we can cover 1% of the world’s deserts with PV panels, we can produce 100% of the world’s energy needs.
- Those living farthest from water source turn to farm sun in place of cotton.
GM tomatoes can withstand 30% higher salinity conditions. Several other crops are currently being developed.

Those living nearest the water source turn to growing more sustainable crops.
Another advancement in GM crops comes in the form of wheat, engineered to grow in drier conditions.

As tall, stalky plants, wheat provides effective buffers from developing sandstorms.

Those living nearest the water source turn to growing more sustainable crops.
Farmer leases land to research organization.
Research does not yield complete crop

Portion sold to market

Insurance paid to farmer by corporation and government
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Preparing

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Preventing

Adapting

Solutions

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Preparing
For cities who rely heavily on the agriculture products imported from conventional farms where yields will be severely damaged by hotter and drier impacts, Urban Agriculture proposes a local agricultural economy in urban regions for helping cool buildings as well as secure food supply in the city.
Urban Agriculture

- Organic agriculture uses less water, less energy but produces the same yields of soybean or corn.

- Local urban farms provide food supply making the city more self-sufficient.

- Incentives encourage land sharing, food selling and promote organic agriculture in the city.
For farmers who suffer **severe agriculture damage** due to drought or desertification, **NewLand** provides **new arable land** so they may continue contributing their knowledge. With **more stable yields** and **expected income**, relocated farmers are given a **second chance**.
NewLand

- Farmers whose land is useless due to desertification can work for urban farms instead.
- These farmers are relocated to cities they prefer so that they can bring their skills in the development of urban farming.
- Stable yields, expected income and incentives encourage farmers to keep growing food feeding the city.
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In many (urban) areas housing is increasing without commensurate improvement in the primary road network. This compromises public safety, as minimum evacuation times are climbing in tandem with vegetation and structural fuels.

Source: Public Safety in the Urban–Wildland Interface
Zoned Evacuation

- Zoned evacuation helps retreat mass of residents on different routes in a short time.
- Each zone has its evacuation priority and path, which controls traffic capacity.
- Zone ID identifies the priority to manage traffic.

When to Evacuation
1. Wildfire out of control
2. Power outage during heat wave

Zoned Evacuation
Zoned evacuation route, priority and schedule are based on different levels of severity and capacity of transportation.

License Plate Zoning
Zone ID
Control the traffic flow at check point
Encourages ride-sharing
Zoned Evacuation

- For elderly people who need to reach safety in a time of crisis, Special-need Registry.net provides support for evacuation.

- Government uses the registry to arrange transportation and shelter plans.

- MediBox provides first-aid for relieving heat stroke by offering wet towels and electrolyte liquids.

Special-needs registry.net

- Hotline to register the special needs shelters
- Update data by networking with health care agencies, hospitals, nursing homes, and pharmacies.

MediBox

- First-aid for relieving heat stroke by offering wet towels and electrolyte liquids.
AutoAlert

- Automated web-based warning notification system
- Expedites prenotification messages to registrant’s contact numbers in escalating basis
For people living in **developed urban regions** of the world who consider to incorporate **sustainable practices** into their lifestyles, the Efficiency Consumption Agency (**ECA**) delivers **simplified access to solutions** with a collection of **knowledge acquisition resources** and **tangible tools** that provide recommendations and **direct access to proven methods and technologies**.
Welcome to AdaptiveNet
Our team of researchers are constantly striving to bring you the latest and greatest solutions for sustainable practices in a hotter, drier world.

AdapTools
Tested products promoting sustainable living

AdapTips
Proven solutions for reducing your resource consumption
Pest-Pedia

- Provide information on diseases that thrive in hotter, drier conditions.
Pest-Pedia

- Provide information on diseases that thrive in hotter, drier conditions
- Campaigns or competitions encourage public sharing of passive techniques against epidemics
AdaptiveNet

• A platform for disseminating tested, tangible solutions
AdaptiveNet

- Provides exposure for proven solutions

AdapTools

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AdaptiveNet

- Provides exposure for proven solutions
- Reduces prices through increased competition

AdapTools

AdapTools
Top matching products
Sort by: Relevance | Most popular | Name | Manufacturer | Rating | Review date | Price

- JustRight
  Check prices
  $233-$268

- ReverseFlow1.5
  Check prices
  $76.88

- ReverseFlow2.0
  Check prices
  $97-$121

Based on Cnet.com

Coping

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AdaptiveNet

- Provides exposure for proven solutions
- Reduces prices through increased competition
- Includes user review platform
AdaptiveNet

- Provides exposure for proven solutions
- Reduces prices through increased competition
- Includes user review platform
- Connects end-users with installers for complex products

Based on Cnet.com

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Coping

Organization | Managing Tools | Policy Solutions | Agriculture Solutions | Emergency Planning | Adapting Methods
JustRight

• 80 billion gallons of water are wasted in the U.S. this way

• Reduces water consumption by pre-mixing desired temperature

• Can be installed to existing faucets

Dial desired temperature then turn on faucet

Coping
RainFlower Bed

- RainFlower Beds would be economically produced.

- Flower boxes act as a filter and a water collection pool.

- Rainwater passes through soil where it is filtered.

- Clean water is collected in the bottom portion of the bed where it is stored for future use.
Zebra Tops

- For every inch of rain, about 600 gallons of water can be collected per 1,000 sq.ft. of roof area.

- Biomimicry of zebra skin; Black stripes attract sun while white stripes reflect, generating micro-vortices.

Micro Vortices create small wind currents which cool rooftop.

During rains, porous concrete rooftops filter water to holding tanks.

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Trials prove green roof helps decrease the temperatures on building top by 44°F.

Incentives encourage people to share their roof tops and to work on gardening.

On building roofs, edible plants can be grown for additional food supply and landscaping plants for beautification.

Green roof applies rainwater collection so drinking water can be conserved.
NuWater

- NUWater faucet provides secondary water that is recycled to various levels of qualities, serving a variety of urban to rural infrastructures.

Agriculture
- Tomato
- Corn
- Potato
- Broccoli
- Spinach
- Snap bean
- Cotton

Industry
- Boiler-feed
- Cleaning
- Flushing toilet
- Urinals
- Dust suppress
- Ground irrigation

Business
- Car washes
- Paper mills
- Cooling stations
- Power stations
- Construction material suppliers

Residential
- Toilet flushing
- Car washing
- Cleaning
- Garden irrigation

Community
- Golf course
- Sports fields
- Cemeteries
- Parks
- Freeway landscaping
- Artificial lake

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Coping

Organization  Managing Tools  Policy Solutions  Agriculture Solutions  Emergency Planning  Adapting Methods
For urban city dwellers that may have high risk of city-wide power outage as a result of power overload under the extreme hot temperatures, PowerOn applies both active and passive measures that secure basic power supply and help citizens cope with power outage in the city.
Power suspension is a way to solve the crisis of city-wide power outage.

NightShift urges people to work in the nighttime as a way to mitigate the power overload in the daytime.

Feellt makes people experience hot impact as a way to address the importance of stable power supply.

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Coping

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Managing Tools
Policy Solutions
Agriculture Solutions
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PowerOn

- During blackout in the district, all sockets fail and all technology gadgets are useless if running out of battery.

- It is necessary to have power supply for emergency purpose such as calling 911.

Prioritized Blackouts

- High Risk
- Moderate Risk
- Low Risk

Priority Zone

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Managing Tools
Policy Solutions
Agriculture Solutions
Emergency Planning
Adapting Methods
Power Outage

- Powered by solar cells and green energy, Plug In Stand provides immediate power supply at hotspots all over the city during blackout.