"Key Elements for a Sustainable World: Energy, Water & Climate Change"

Cam Metcalf, Executive Director

2nd International Workshop: Advances in Cleaner Production
May 21, 2009

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"Key Elements for a Sustainable World: Energy, Water & Climate Change"

Source: www.wwf.org.uk

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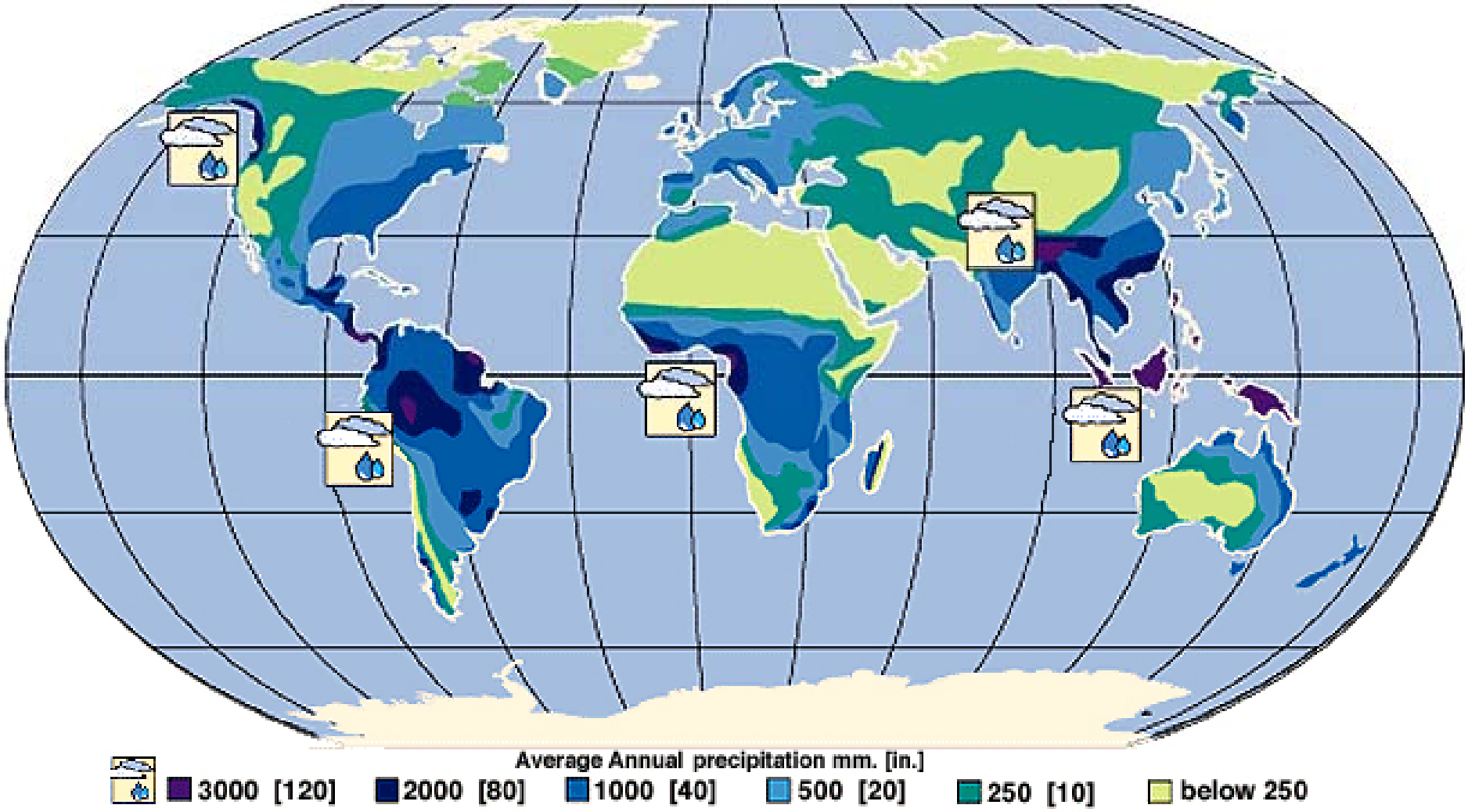
Annual Rainfall World Map



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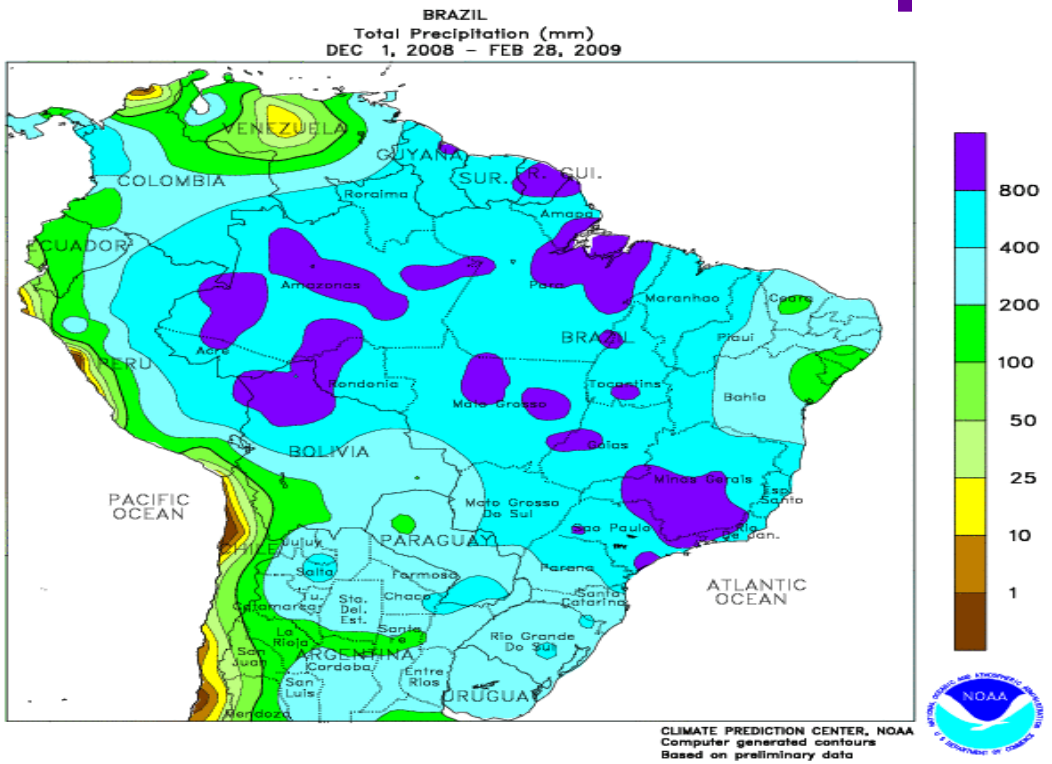
Brazil Rainfall Map



- ✓ **Brazil is a country rich in water (12-14% of the world's water)**
- ✓ **70% of the water in Brazil is in Amazon River**
- ✓ **With 25% of the population, only 1.6% of the water is in the State of Sao Paulo**

Sao Paulo's Most Important Water Challenges

- Water scarcity
- Urban sprawl & poverty leading to water pollution compounding the problem of scarcity
- Conflicts over using water for drinking, irrigation or industrial processing
- Command & control regs mostly limited to state's largest industries & worst polluters
- 40% of water supplied to the network is lost through leakage or is not being billed

Improving the Efficiency of Water Use

- Focus on activities that increase the availability of water in the state
- Promote the rational use of water
- Construct sanitation systems
- Incentivize the reuse of treated wastewater
- Reduce non-revenue water use

Drought: Driver for "Water Intensive" Industries' Action Plan

Goal: Develop institutional partnerships that work to reduce drought risk

Goal: Facilitate implementation of risk reduction activities during non-drought years

- **Communication & Outreach**
  - ✓ **Optimization of water sources (operate water assets better)**
  - ✓ **Vulnerability assessment for "water intensive" industries**
  - ✓ **Institute Process Water Management (PWM) Program**
- **Deployment of water conservation technologies & practices with trials & demonstrations**

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Mission

KPPC is Kentucky's primary resource to help businesses, industries and other organizations develop environmentally sustainable, cost-saving solutions for improved efficiency.

Based at the University of Louisville J.B. Speed School of Engineering, KPPC provides technical information and assistance that is free, confidential and non-regulatory.

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What is KPPC?

- KPPC is a non-profit organization established in 1994 through a state legislative mandate
- Provide statewide technical assistance & outreach programs
- Based at the *University of Louisville's* J.B. Speed School of Engineering
- Represents the *University of Louisville* as a nationally recognized Center of Excellence
- Provides hands-on training for students through the Cooperative Education Program at SSoE

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Winner 2008 National Pollution Prevention Roundtable's

Most Valuable P2 Program Award

(Awarded September 18, 2008)

The National Pollution Prevention Roundtable, a 501(c)(3) non-profit organization, is the largest membership organization in the United States devoted solely to pollution prevention (P2).

The mission of the Roundtable is to provide a national forum for promoting the development, implementation, and evaluation of efforts to avoid, eliminate, or reduce pollution at the source.

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Green. It's Happening Here.

1. ***" Business strategies built around***
2. ***the radically more productive use of natural resources***
3. ***can solve many environmental problems***
4. ***at a profit"***

Amory Lovins, Hunter Lovins & Paul Hawken
"A Road Map for Natural Capitalism" 1999

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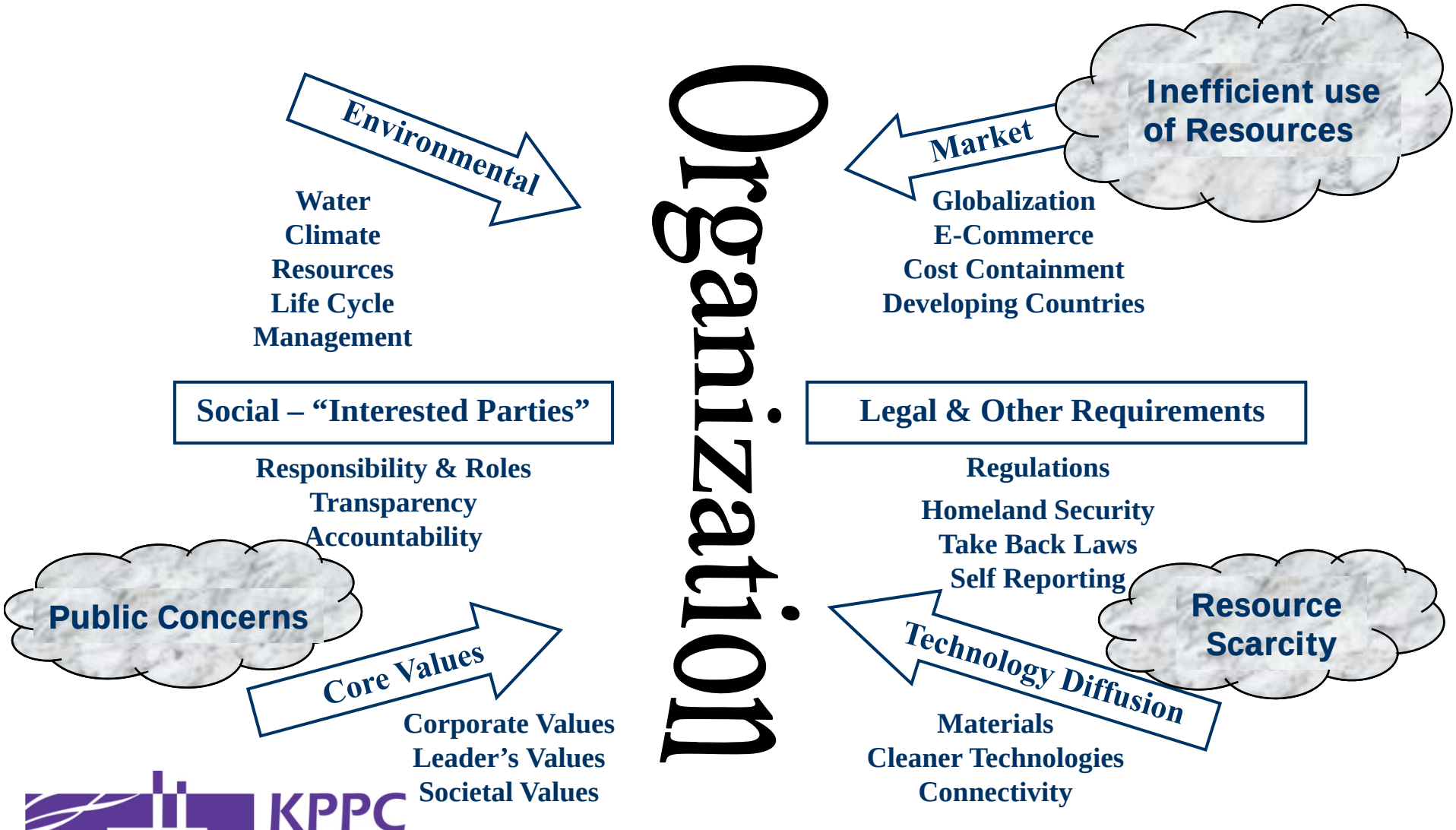
The Big Squeeze is on!

There is a global business environment!



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Our “Universal Backyard”

- ❑ NIMBY
- ❑ NOTE
- ❑ BANANA
- ❑ CAVE
- ❑ NOPE

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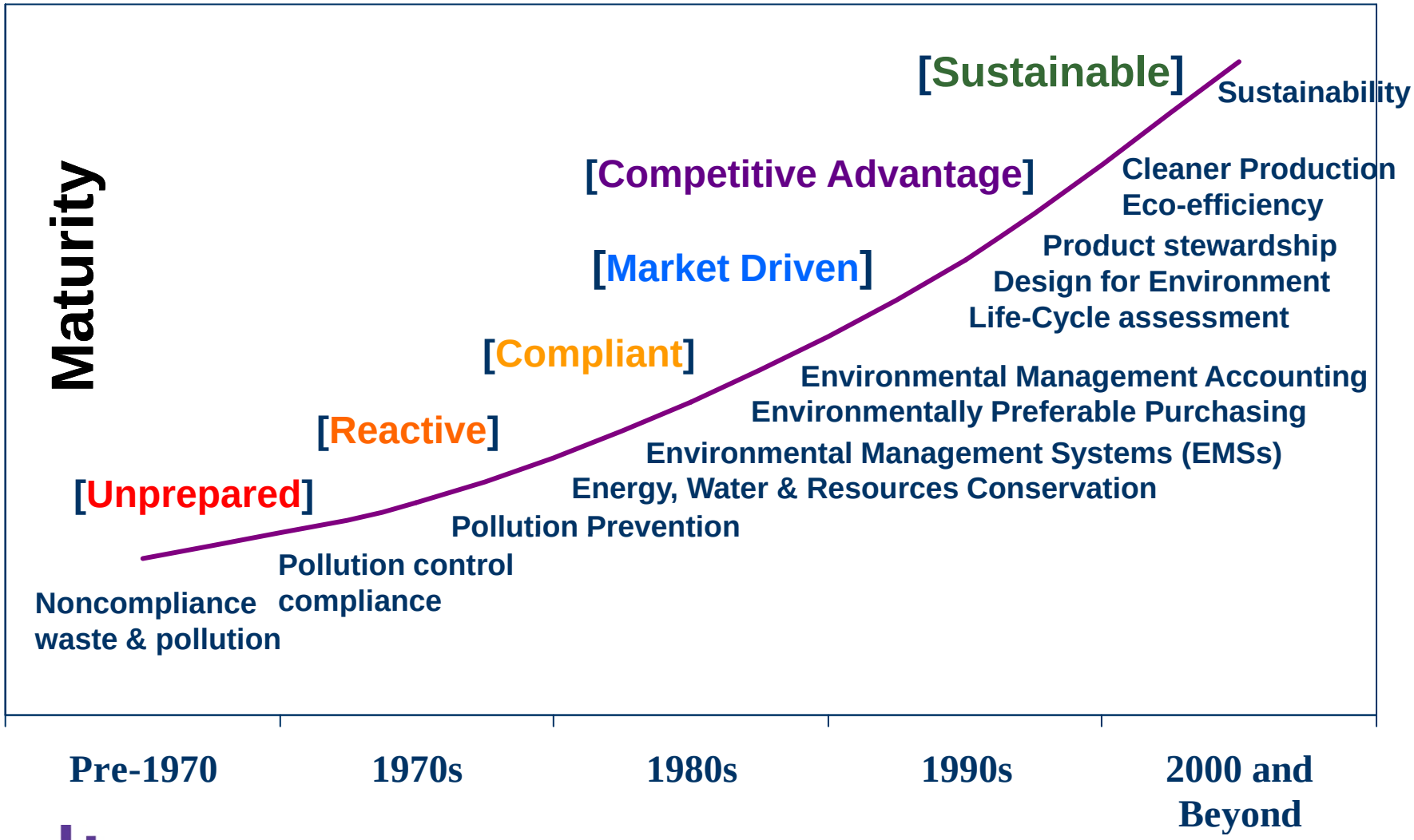
Evolution of Business



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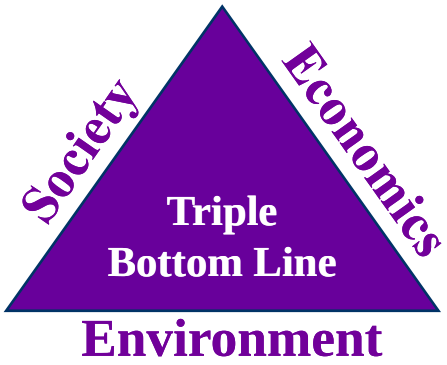
Sustainable Performance

❑ The Triple Bottom Line

- ✓ Social & individual well-being & involvement
- ✓ Strategic plan for economic goals
- ✓ Environmental management guiding principles



- Pollution prevention & cleaner production
- Continual improvement of environmental performance
- Compliance with all regulations
- Conservation of natural & cultural resources

Integrating Management Systems for Sustainability

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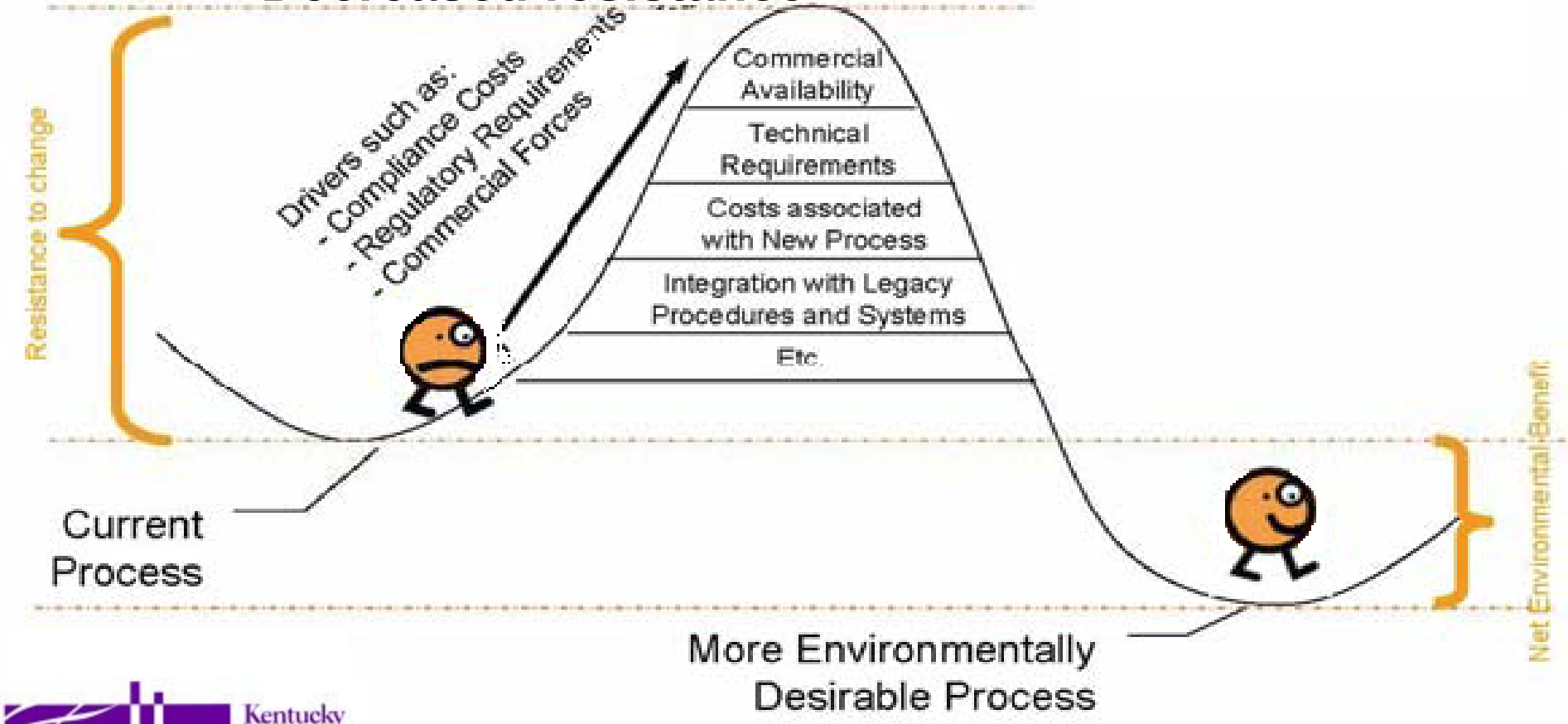
Implementing Change

- **Change requires a combination of:**
  - ✓ **Increased drivers**
  - ✓ **Decreased resistance**



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Obstacles Encountered

- ✓ Fear of change
- ✓ Commercial availability
- ✓ Technical requirements
- ✓ Limited resources
- ✓ Communication
- ✓ The environment is “not my job”
- ✓ Moving BEYOND compliance

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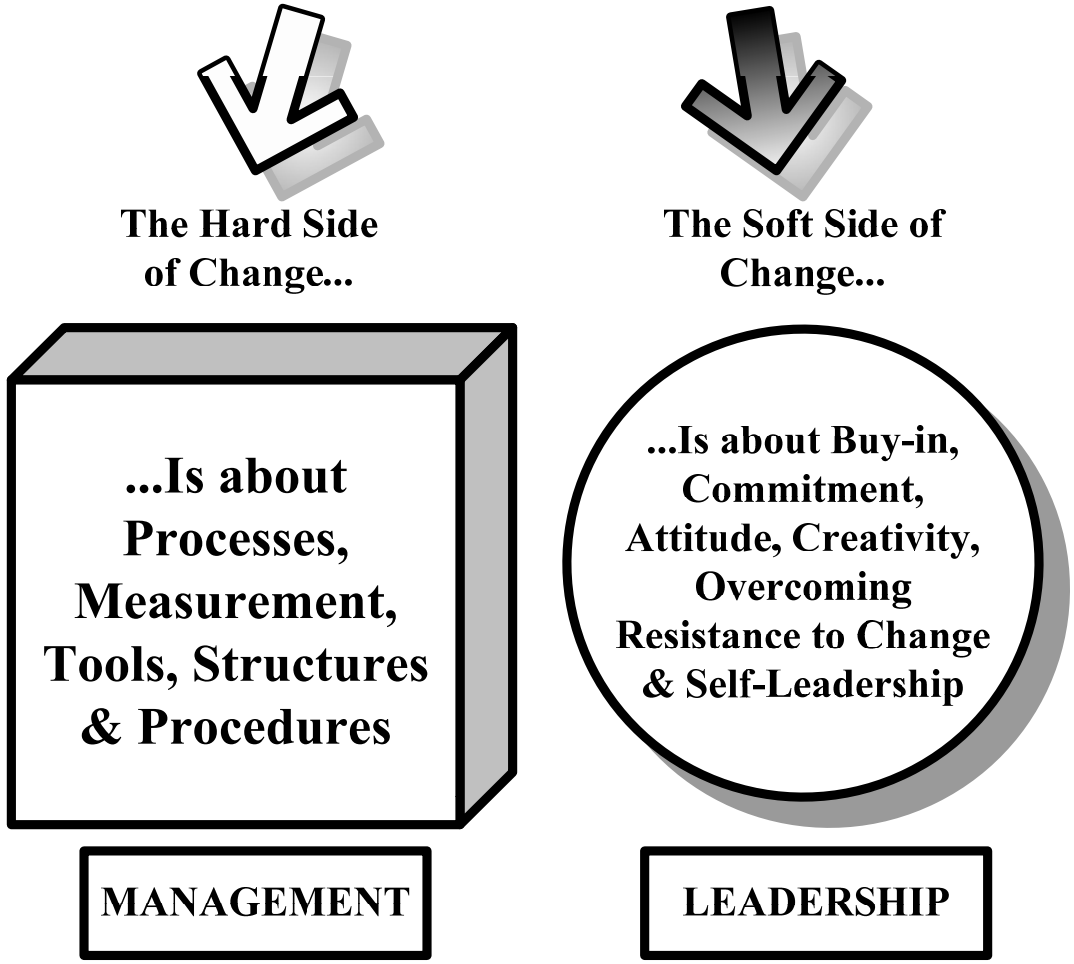
There are Two Sides of Organizational Change



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Environmental Management System

- ✓ **Provides a systematic approach to review & improve operations for better environmental performance & improved profitability by setting up procedures that ensure the work gets done safely, consistently, efficiently & effectively.**

"Smart Business"

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Environmental Excellence!

Is everyone working from the latest policies & procedures (ISO 14001:2004)?

SAY WHAT YOU DO,
DO WHAT YOU SAY!

IF IT MOVES, TRAIN IT!

IF IT DON'T MOVE, CALIBRATE IT!

BUT NO MATTER WHAT YOU DO,
DOCUMENT IT!!!

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‘90 Pollution Prevention (P2) Act Defines Source Reduction as:

Any practice which reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions)

prior to recycling, treatment, or disposal;

and reduces the hazards to public health & the environment associated with the release of such substances, pollutants, or contaminants.

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P2 = Source Reduction

- **P2 means "Source Reduction" and other practices that reduce or eliminate the creation of pollutants through:**
  - ✓ **increased efficiency in the use of raw materials, energy, water or other resources, or**
  - ✓ **protection of natural resources by conservation.**

Resource Management

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Multimedia Approach for Environmental Excellence

- ✓ **Water**
- ✓ **Air**
- ✓ **Solids**
- ✓ **Time**
- ✓ **Energy Efficiency (E2)**

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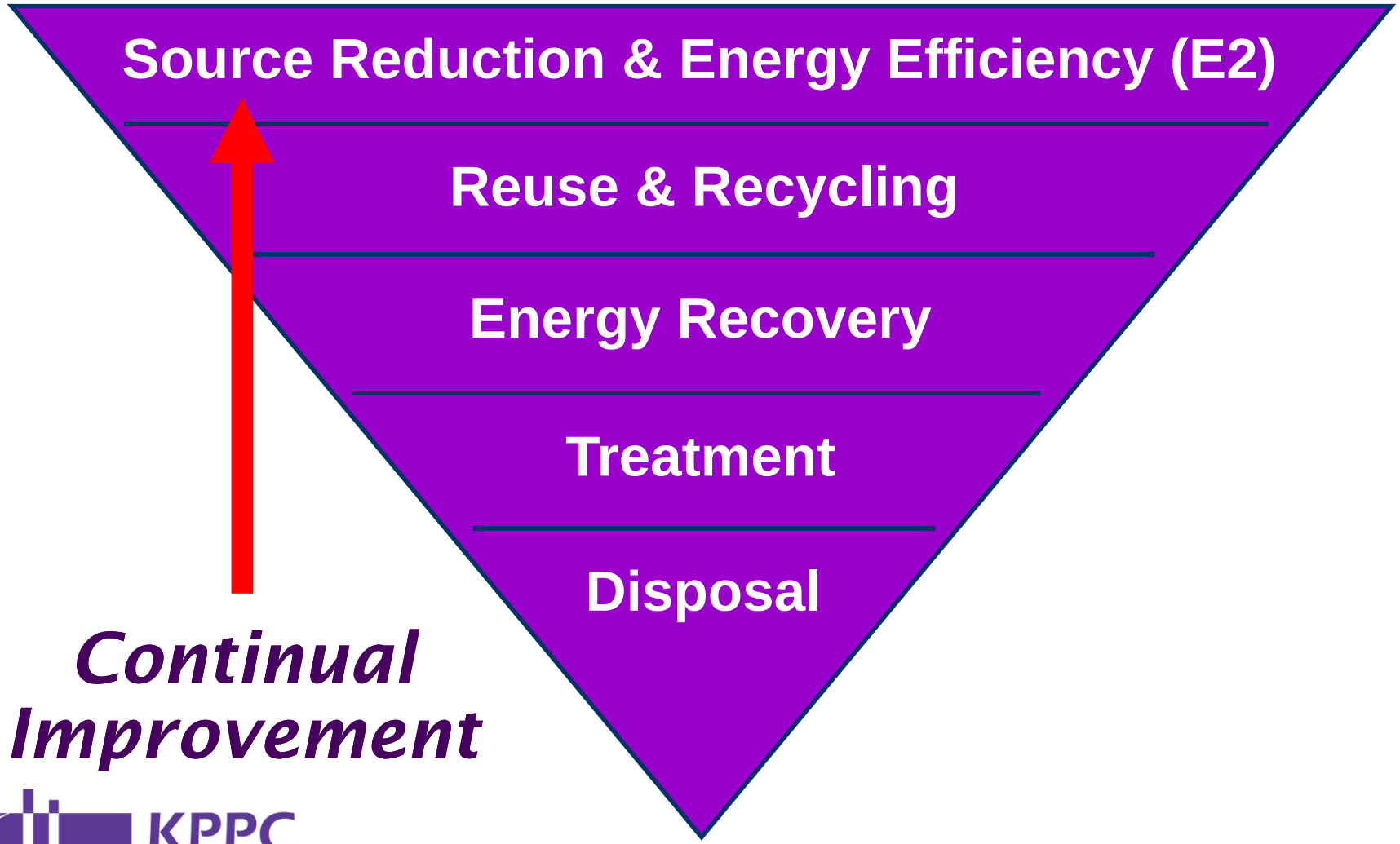
Proactive Planning: Move Up the Hierarchy



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EMS: Value Added

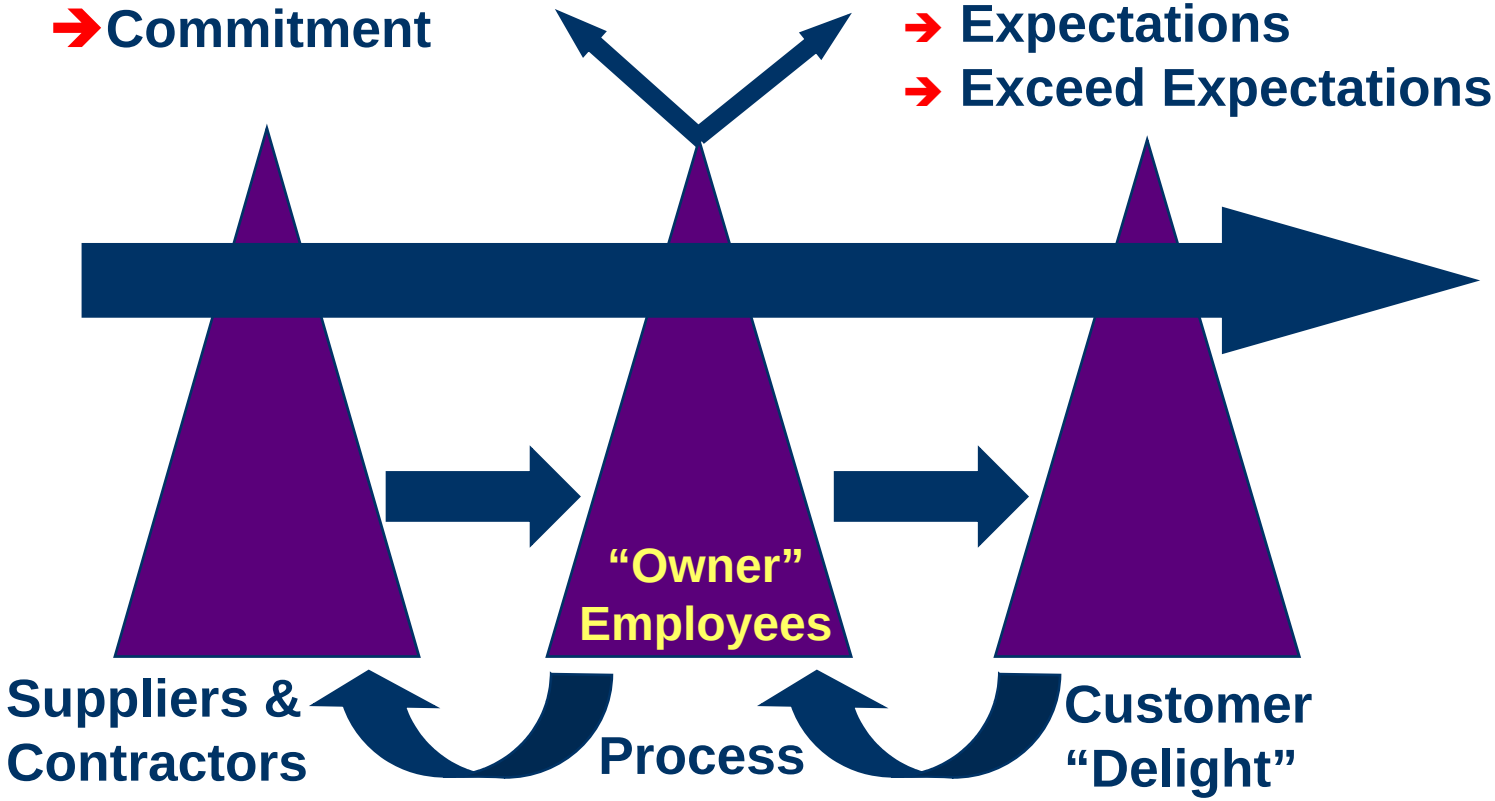
Operational tool for an organization's business plan!

Prevent Waste:

- ➔ Involvement or
- ➔ Commitment

Add Value:

- ➔ Fulfillment
- ➔ Expectations
- ➔ Exceed Expectations



Customer Satisfaction is Worthless; Customer Loyalty is Priceless!

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Technology Diffusion Initiative

Using Process Water Management (PWM) to Conserve Resources & Improve Competitiveness

Cam Metcalf, Executive Director

2nd International Workshop: Advances in Cleaner Production
May 20, 2009

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Program Background

Technology Diffusion Initiative

Diffusion = Demonstration + Deployment

- ✓**Federal appropriations & EPA grant**
- ✓**Market conditioning for proven P2 & E2 technologies & practices by sector**
  - **Metal Finishing**
  - **Painting/Coating**
  - **Fiberglass**

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Industrial

Process Water Management (PWM)

Water = Common Denominator

Using Environmental Performance to

- ✓ **Increase competitive advantage**
- ✓ **Achieve sustainability**

By implementing Process Water Management (PWM) for Pollution Prevention (P2) & Energy Efficiency (E2)

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Top Ten Industries in Sao Paulo

- ✓ Telecommunications
- ✓ Automotive
- ✓ Banking
- ✓ Pharmaceutical
- ✓ Beauty & Cosmetics
- ✓ Fashion
- ✓ Electronic Appliances & Computers
- ✓ Food Processors
- ✓ Consulting
- ✓ Construction

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Common Water Uses in Brazil

- ✓Cooling towers & chillers
- ✓RO units & DI water units
- ✓Boilers & water heaters
- ✓Once through cooling water
- ✓Cleaning & rinse water
- ✓Oil & water lubrication
- ✓Sanitary
- ✓Lawn care

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Plant Water Usage: Price or Cost

Cooling Towers/Chillers

Air Compressors

Boilers

Mop Water

Rectifiers/Welders

Manufacturing Plant

Production Line Stages

Pre-Rinse Stages

Alkaline Cleaning Stages

Post Rinse Stages

Multi-Stage Parts Washer

RO or DI Unit

Waste Water Treatment (WWT)

Incoming Fresh Water

Sanitary Usage

Outgoing Sewer Water

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The Short & Sweet of PWM
Price vs. Cost

- **PRICE of water**
  - ✓ Incoming H_20 at the meter + sewer charge = price
  - ✓ Usually not recognized as a significant cost

- **COST of water**
  - ✓ Cost = price + added costs as it flows through processes & waste water treatment
  - ✓ Could be a big number & is usually lost in overhead
    - 4-5 cents per gallon or up to 50 cents
  - ✓ Example: Price = $200,000
    Actual = $7,000,000

- **PWM identifies all costs & quantifies savings opportunities at each identified process for water, chemical & energy usage**

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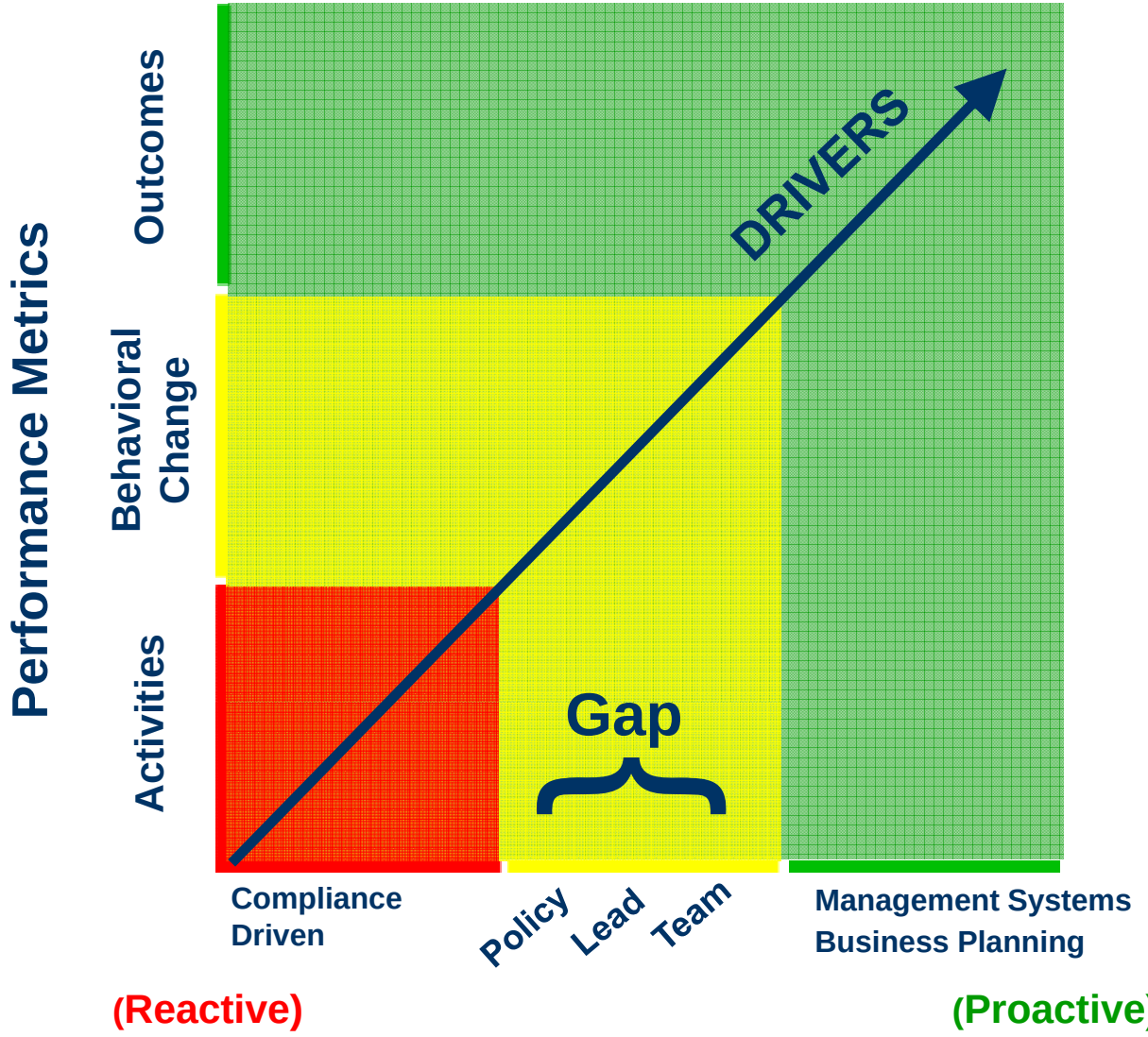
Organizational Capability



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PWM Drivers

- Water intensive companies engage in PWM projects because it is a tangible, visible & a familiar media
- Water media is less complex than trying to attack everything at once
- Early successes help energize the team to identify other operations where significant environmentally related cost savings can be identified
- PWM connects to offline support operations such as RO units, DI units, boilers, air compressors & cooling towers

“Cultural Technology”

- ✓ **Some client’s organizations are not ready to explore & implement new technologies or concepts**
- ✓ **The price & cost of water usage was not understood in “water intensive” industries**
- ✓ **PWM allows organizations to successfully address, demonstrate & deploy profitable environmental solutions**
- ✓ **7-step process provides internal structure for transition from reactive to proactive**

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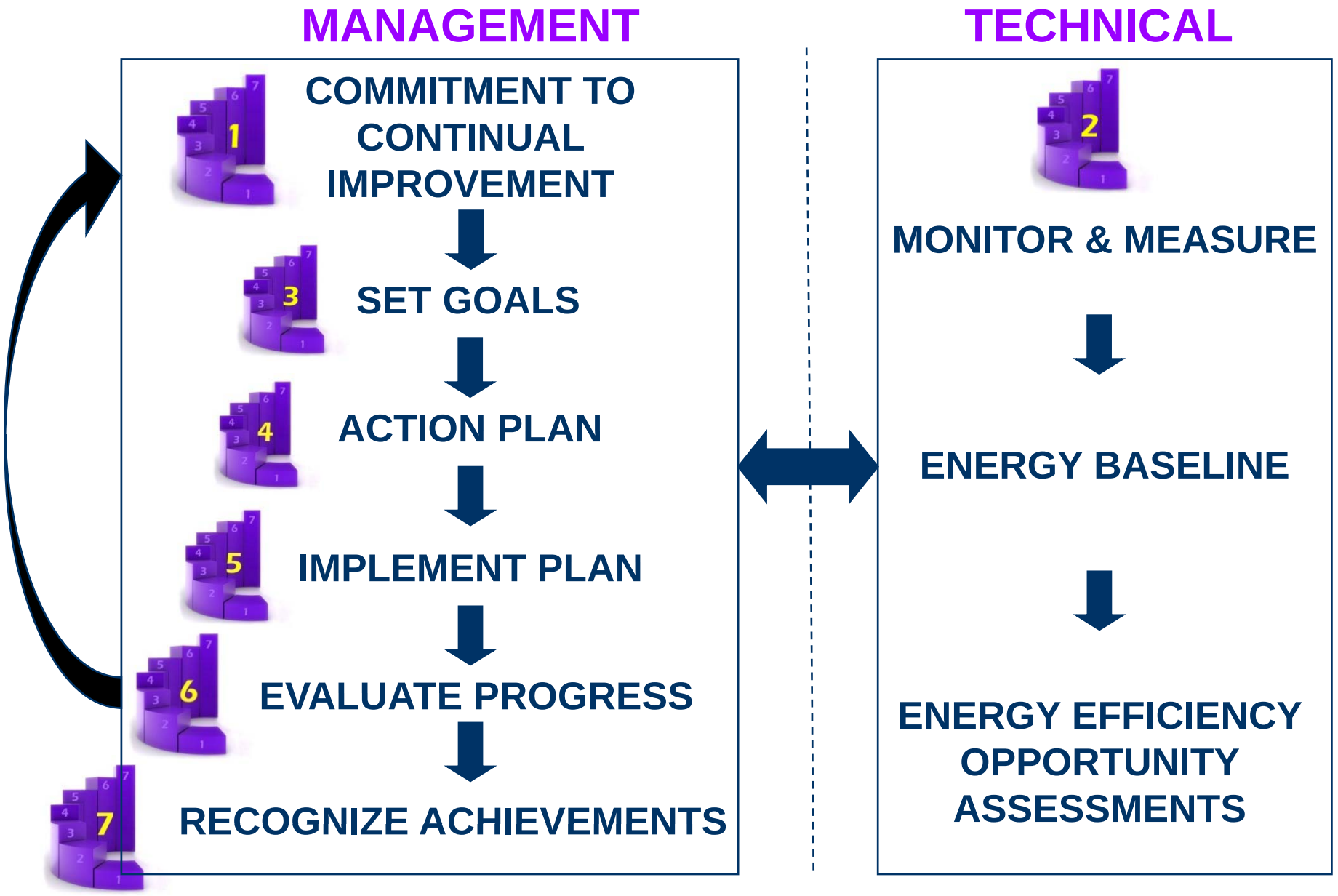
7-Step Process Water Management



Process Water Management (PWM) Process

Make Commitment to Continual Improvement

- ✓Water Conservation Policy
- ✓Cross-functional Water Team
- ✓Appoint Water Team Leader

Assess Performance & Opportunities

- ✓Track & monitor water use & costs
- ✓Develop baseline (& benchmark)
- ✓Identify water reduction opportunities

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Process Water Management (PWM)

Set Goals

- ✓Performance goals
- ✓Clear & measurable goals
- ✓Guide daily decision-making

Create Action Plan

- ✓Roadmap to improve water use performance
- ✓Ensures a systematic process
- ✓Regularly updated to reflect achievements

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Process Water Management (PWM)

Implement Action Plan

- ✓Investigate & verify options
- ✓Develop & justify capital investment
- ✓Develop a timeline
- ✓Identify resources

Evaluate Progress

- ✓Review water use data & activities
- ✓Compare effectiveness to performance goals
- ✓Document “best practices”
- ✓Create new action plans
- ✓Set new performance goals

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Process Water Management (PWM)

Recognize Achievements

- ✓Facility, team & individuals
- ✓Water use & cost reductions
- ✓Discharge/pollution reductions
- ✓State & National Recognition & Awards Programs

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PWM Benefits

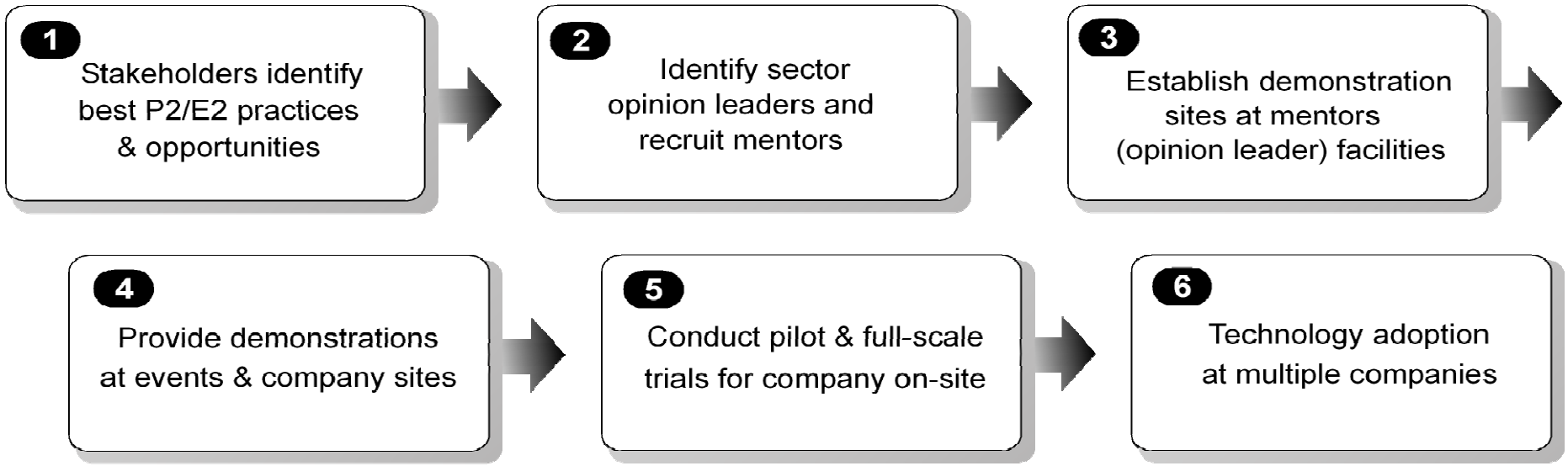
- **Process Water Management is a process of continual improvement:**
  - ✓ **Define water usage goals**
  - ✓ **Organize the water management project (s)**
  - ✓ **Implement steps to increase water use efficiency**
  - ✓ **Regularly assess water performance**
  - ✓ **Involve all levels of the organization**
- **Financial returns from PWM**

STAY FOCUSED ON THE TASK

Improve Market Conditioning

- No "buy in" for P2/E2 technologies being "pushed" upon industries with an "unnecessary" additional cost
- TDI marketing is "pull" approach that probes industry leaders & experts for their needs, viewpoints & demands
  - ✓ Stakeholder groups are a powerful tool

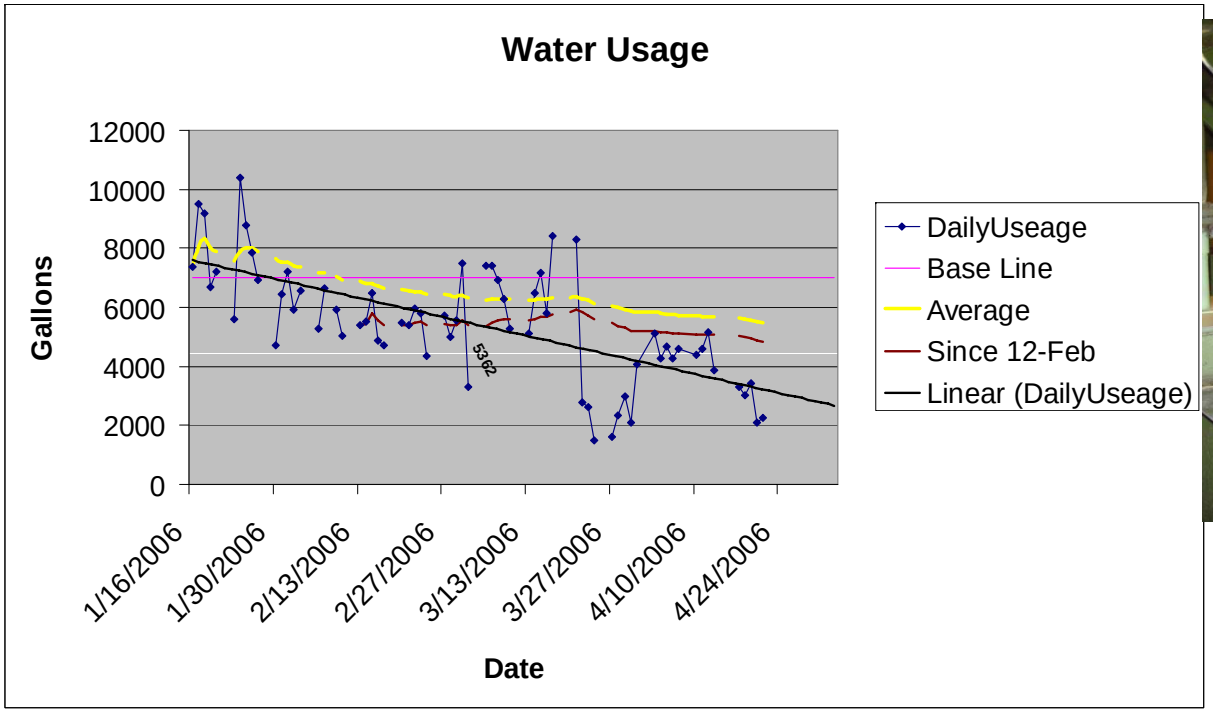
Figure 1 ADOP^{2}T™ Program Process Map



Conductivity Rinse Water Controllers for Electro Deposition Paint Line

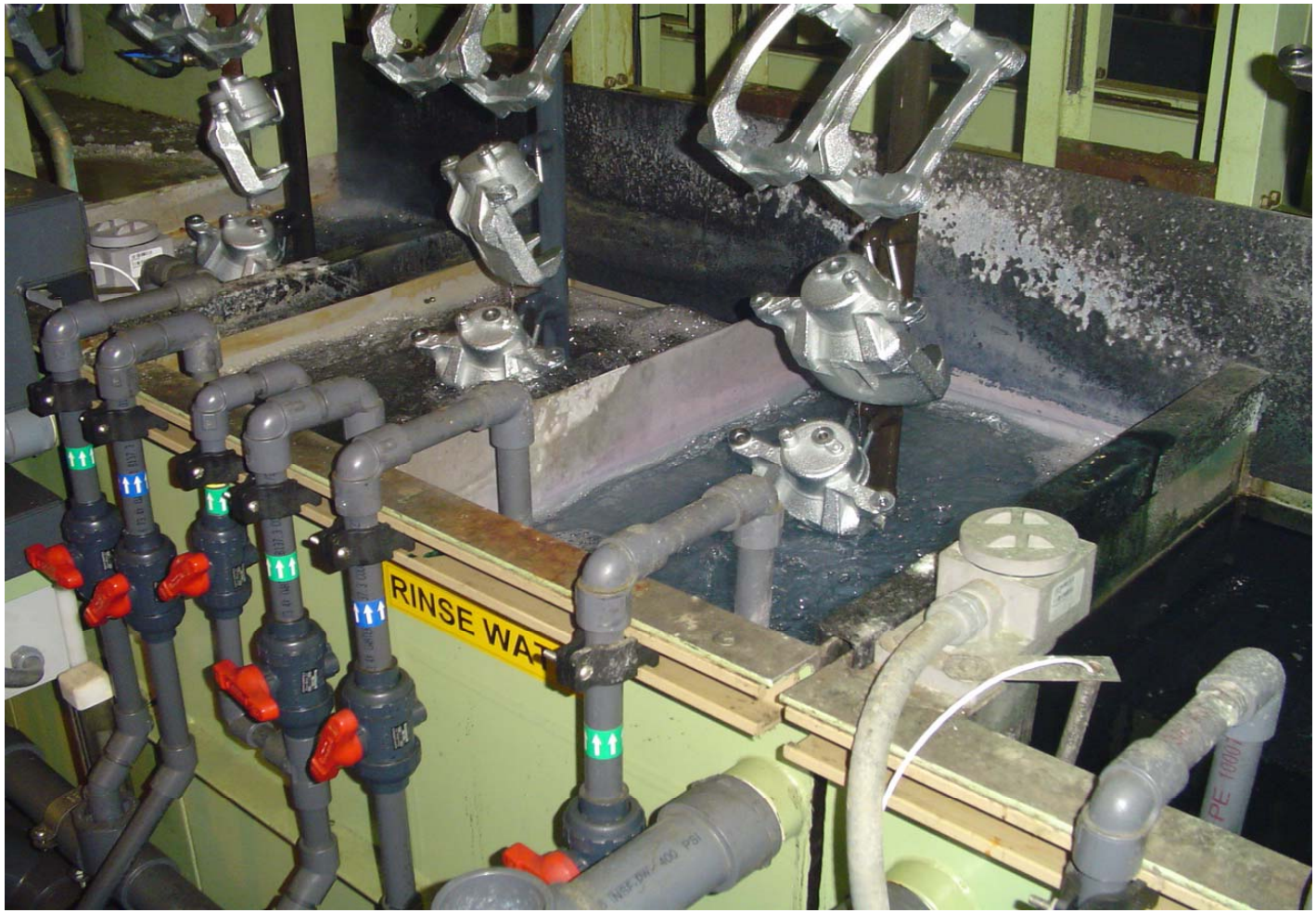
Automobile Parts Manufacturer

- **Before trial used 7,600 GPD**
- **After 3 months trending to 2,700 GPD**
- **Conserves water resources**
- **Saves money in treatment chemicals & sludge hauling**



EPA WATER EFFICIENCY LEADER AWARD

Two Stage Counter Flow Rinse



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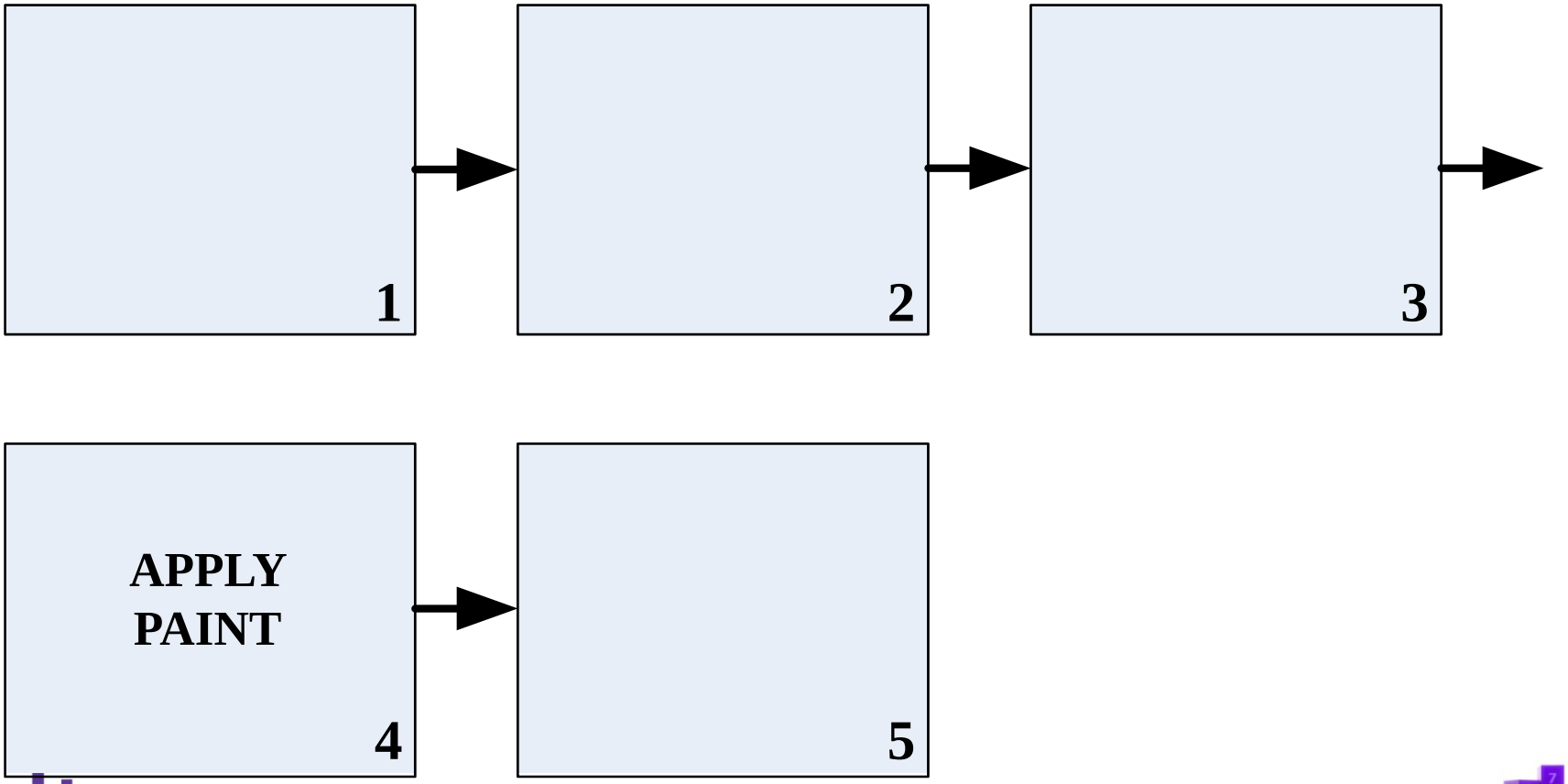
EPA WATER EFFICIENCY LEADER AWARD

PROGRAM SUMMARY	GALLONS	POUNDS	KWHs	MM BTUs	DOLLARS
WATER					
Water Use Reduce Gallons	2,128,688,200				
$ Savings Meter & Sewer $$					$1,431,727
CHEMICALS					
WWT Chemical LBS. Savings		175,200			
Other Chemical LBS. Savings		2,256,170			
$ Chemical Savings $$					$411,955
ENERGY					
Electricity = KWH			5,552,401		
Natural Gas = BTUs MM				131.87	
$ Energy Savings $$					$1,133,966
WASTE					
Solid Waste LBS.		5,107,300			
Liquid Waste Reduce Gallons	30,513,600				
$ Waste Savings $$					$433,050
SAVINGS & INCOME					
$ Other Savings $$					$671,643
$ Income Produced $$					$16,987
OUTCOMES =	2,159,201,800	7,538,670	5,552,401	131.87	$4,099,328
	GALLONS	POUNDS	KWHs	MM BTUs	DOLLARS

TRAKM

Process Map of Painting Activities

What are the 5 main processes or activities associated with painting?



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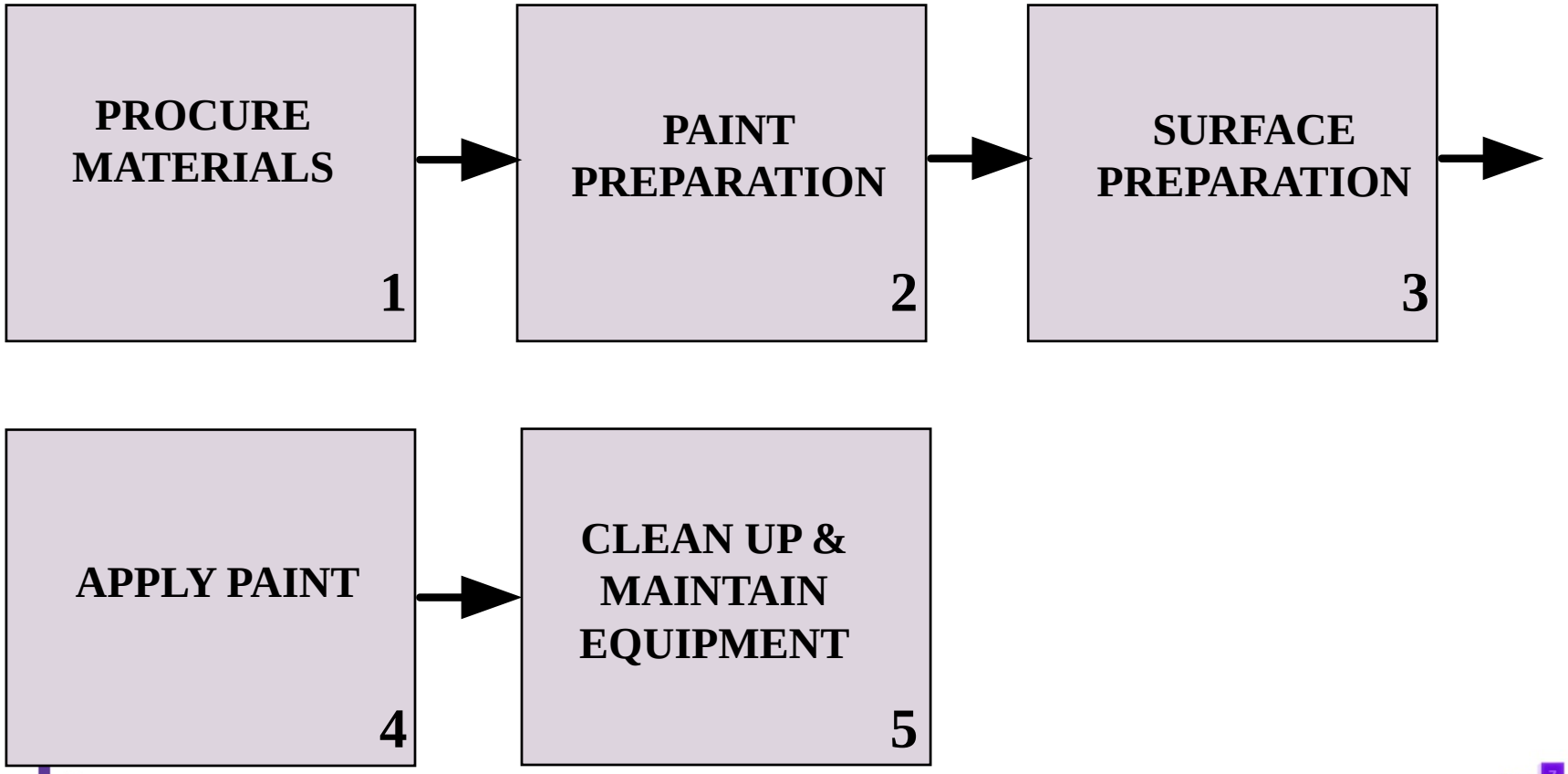
Process Map of Painting Activities

What are the 5 main processes or activities associated with painting?



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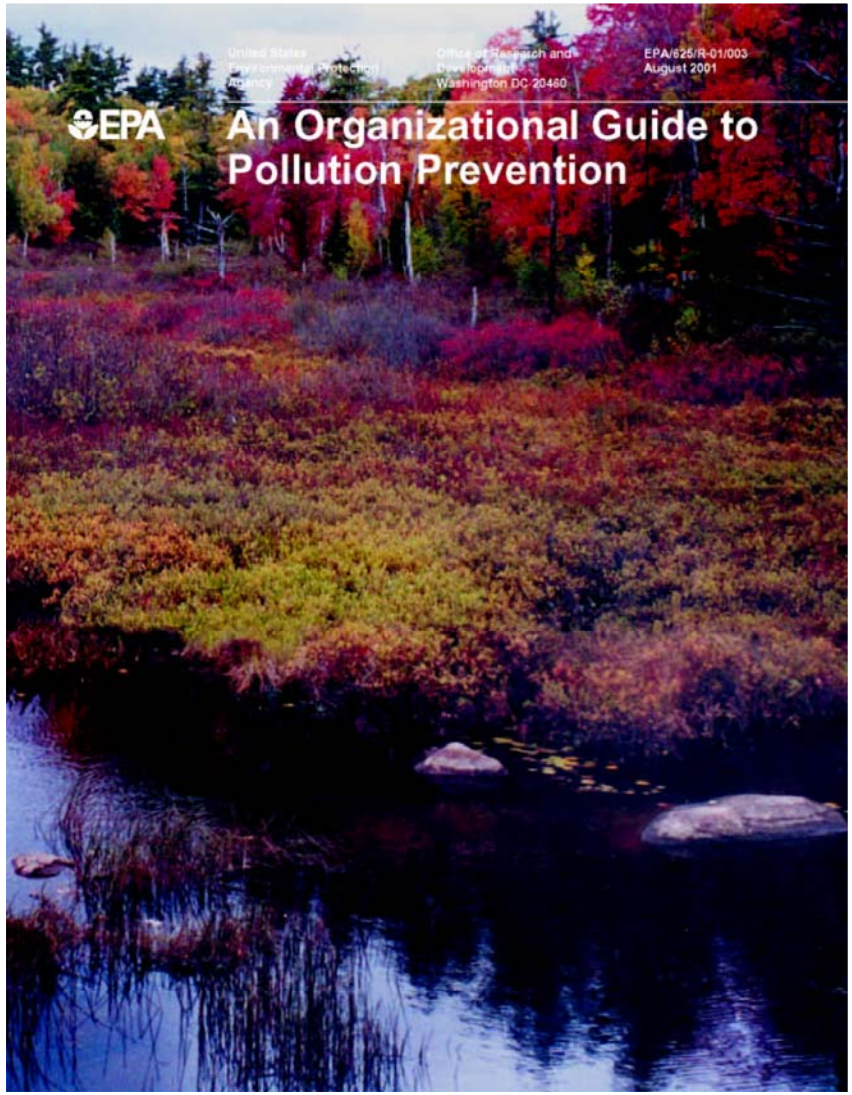
An Organizational Guide to Pollution Prevention

Publication #
EPA/625/C-01/003

- ✓ **A new approach, unlike previous assessment manuals**
- ✓ **Basic P2 Concepts and Tools**
  (Chapters 1-4)
- ✓ **P2 Program Implementation Approaches**
  (Chapters 5-8)



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My Old Kentucky Home

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KPPC Contact Info

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(502) 852-0965

Fax: (502) 852-0964

MVP 2

EPA WATER EFFICIENCY LEADER AWARD

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