



## Sustainability & Infection Control: *Solutions for people and the planet*

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Interest Group – Infection  
Prevention & Control - Canada

Sponsored By:  
**Sealed Air**  
Performance Group

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## Major Drivers: *Significant Social Change*



By 2050...

- 70% of people will live in cities
- Population stress: 9.3 billion people (compare to 3 billion in 1955)
- Number of cars in China will increase from 26 million in 2003 to 120 million by 2020
- Average income will increase 2.8 X
- Emerging markets will dominate trade
- More than 5 billion middle class people
- Consumption will double

Source: Australia Foundation for World Population and International Cooperation

Current Population Clock  
U.S. 324,220,393  
World 7,296,333,993  
17:04 UTC (EST+5) Feb 20, 2015



Data Source: WWF Living Planet Report, United Nations Environmental Programme, McKinsey, 2012

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## Major Drivers: *Diseases Threaten Public Health*

- MRSA, drug-resistant bacteria, infects 75,300 people annually in U.S.; now moved from hospitals into community
- 9,500 deaths attributed to Ebola in West Africa, with significant public concerns globally
- 154 new cases of measles in U.S. in 2015
- 7-fold increase in antibiotic resistant E. coli in last 10 years
- Avian Flu, Foot and Mouth Disease have resulted in destruction of millions of farm animals
- E-Coli, Salmonella incidents common, outbreaks cost companies \$ millions
- Average Chinese citizen food poisoned once per week
- Illness, lost productivity cost more than \$120 billion annually in U.S.




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## Major Drivers: Environmental Challenges

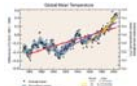
### Water

- Great rivers no longer reach the sea: Indus, Rio Grande, Colorado, Murray-Darling, Yellow
- Ogallala aquifer is down 80 trillion gallons and withdrawn at 6X rate of replenishment
- 2.8 billion people living in water stress areas



### Energy/Climate

- 2014 warmest year on record - globally
- By 2020, climate warming could cut agriculture production 1, 1.7%



### Materials

- 15 million tons of fish harvested in 2011 with many fisheries depleted
- 6 billion hectares deforestation since 1800



Source: Global Global Footprint Network, 2011

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## Consumption Exceeding Supply

If entire world consumed at rate of U.S. we would need...



11 Planet Earths

1. WWF Living Planet Report

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## Key Sustainability Issues for Healthcare

- Population growth, mobility, and demographic changes increase healthcare needs while environmental challenges and resource constraints impact costs and cause disruptions
- Impacts on healthcare needs
  - Climate change impacting patterns of disease and natural disasters
  - Lack of clean water increases disease
  - Changing food consumption patterns increases chronic disease
- Higher costs and lower availability of materials and resources
  - Waste handling costs
  - Energy costs and supply disruptions
  - Water costs
  - Petroleum-based materials (e.g. chemicals, pharmaceuticals, polymers)

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### Sustainable Practices in Healthcare



- 1 Water Conservation
- 2 Green Environmental Hygiene
- 3 Policies & Procurement
- 4 Energy Conservation

REUSE REUSE REUSE

We will not discuss energy conservation in this session

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# 1 WATER CONSERVATION



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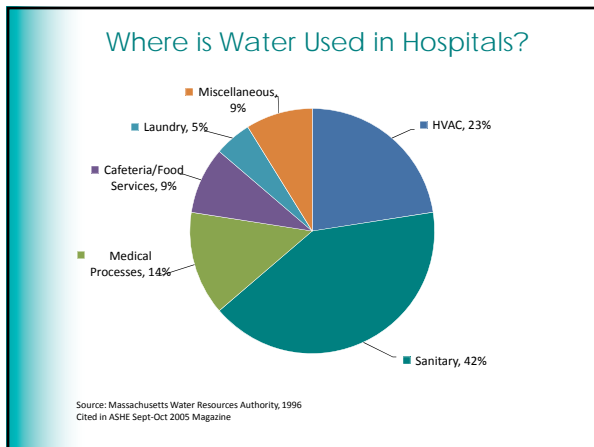
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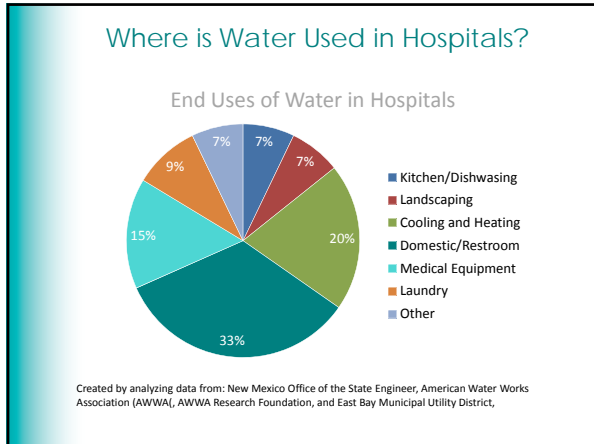
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### Challenges in Water Conservation

- **Scientific**

Example 1

- Hand hygiene recommendations - IPAC
- Healthcare Facility Design position statement - IPAC
  - There should be sufficient hand washing sinks such that staff do not need to walk more than 6.1 meters/20 feet to reach the sink.
- Use of faucet aerators is not recommended - IPAC



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### Challenges in Water Conservation

- **Scientific**

Example 2

- Hemodialysis water requirements
  - Approx 500 L of water per 4 hour session
  - x3 = 1500 L/week
  - Or 6000 L per month



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### Challenges in Water Conservation

• Demographic

- Population is aging

Senior (>65) population in Canada	
2010	2036 projection
14% (4.8 million)	25% (10.4 million)

- Seniors use more healthcare
  - In 2009-2010, 40% of acute hospital stays were for seniors (despite being on 14% of the population)
- Seniors stay longer in hospital
  - Overall LOS in acute inpatient setting - 9 days (vs 6 for the rest)



Canadian Institute of Health Information

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## 2

### GREEN ENVIRONMENTAL HYGIENE



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### Green Environmental Hygiene

• May be divided into 2 parts for our discussion:

- Green Environment
  - Green Cleaning
  - Operational changes
  - Design changes



- Reduction of waste



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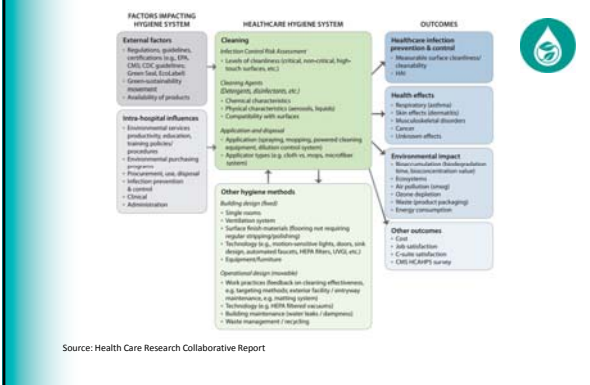
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## Green Environment – Conceptual Framework




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## Green Environment

- Green Cleaning Products**
  - Using Certified Products
    - general purpose cleaner
    - glass cleaner
    - carpet cleaner
    - floor cleaners
    - waxes
    - restroom cleaner

Source: Health Care Research Collaborative Report

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## Green Environment

- Operational Changes**
  - appropriate cleanliness levels
  - application and dispensing optimization
  - cleaning equipment & accessories changes

Source: Health Care Research Collaborative Report

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## Green Environment

- **Buildings**
  - Interior Design
    - Floor finish
    - Interior design
    - Movable furniture
  - New buildings and major renovations
    - Environmentally preferable design elements
    - Certified through 3-rd parties like LEED (USGBC), GGHC, or Green Globes

Source: Health Care Research Collaborative Report

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## Challenges in Green Environment

- **Scientific**

Examples

  - Studies showing inefficacy of air hand dryers in healthcare setting



**SUMMARY**

**Background:** The efficiency of hand drying is important in preventing pathogen spread, but knowledge surrounding which drying methods contribute least towards contamination of the environment and users is limited.

**Aim:** To compare the propensity of three common hand-drying methods (jet air, warm air dryers, and paper towels) to contaminate the environment, users, and bystanders.

**Methods:** Hands were coated in lactobacilli to simulate poorly washed, contaminated hands, and dried. The investigation comprised 120 air-sampling tests (60 tests and 60 controls), divided into close and 1 m proximity from the drying process. Separate tests used hands coated in paint to visualize droplet dispersal.

**Findings:** Air bacterial counts in close proximity to hand drying were 4.5-fold higher for the jet air dryer (70.7 cfu) compared with the warm air dryer (15.7 cfu) ( $P = 0.001$ ), and 37-fold higher compared with use of paper towels (2.4 cfu) ( $P < 0.001$ ). Airborne counts were also significantly different during use of towel drying versus warm air dryer ( $P = 0.001$ ). A similar pattern was seen for bacterial counts at 1 m away. Visualisation experiments demonstrated that the jet air dryer caused the most droplet dispersal.

**Conclusion:** Jet air and warm air dryers result in increased bacterial contamination when drying hands. These results suggest that air dryers may be unsuitable for use in healthcare settings, as they may facilitate microbial cross-contamination via airborne dissemination to the environment or bystanders.

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Best et al., Journal of Hospital Infection, 2014

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## Reduction of Waste



**Hospital Waste in Canada**

Waste Category	Percentage
Paper	45%
Food	17%
Plastics	14%
Liquids	6%
Misc	5%
Biomedical	5%
Wood	3%
Glass	3%
Metal	2%

Source: www.sustainabilysolutions.ca

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**3**  
**POLICIES AND PROCEDURES**  
Bringing it all together



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**Environmentally Preferable Purchasing (EPP)**

- Purchasing products/services whose environmental impacts have been found to be less damaging to the environment and human health when compared to competing products/services.
- EPP can be the key to saving money and reducing waste while meeting the needs of patients.



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**Green Principles Policies**

Here are some examples:

 DHMC	 Northern Michigan Regional Hospital	 Boulder Community Hospital
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**4**  
**ENERGY CONSERVATION**



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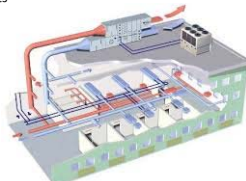
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**Energy Conservation**  
**Air Flow & Quality vs. HVAC Optimization**

- Air Volume Exchange
- Mix (Fresh / Recycled)
- Pressurization
  - ER & Inpatient Isolations (Negative)
  - Operating Suite, Sterile Storage (Positive)
- Temperature & Humidity controls
  - OR, ICU
- System Cleaning & Filtration management
  - HEPA filtration in critical environments
  - Legionella & mold
  - UV-C disinfection
- Construction & Renovation
  - System maintenance
  - Construction & renovation



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**Evaluation Methods & Sustainability Frameworks**

- How to make decisions in an uncertain world?
- What is the best way to dispose of plastic?
- When are bio-based materials better than petroleum-based?
- Is a higher energy & lower water solution better than a lower energy & higher water solution?
- Is a Prius better than a SUV?

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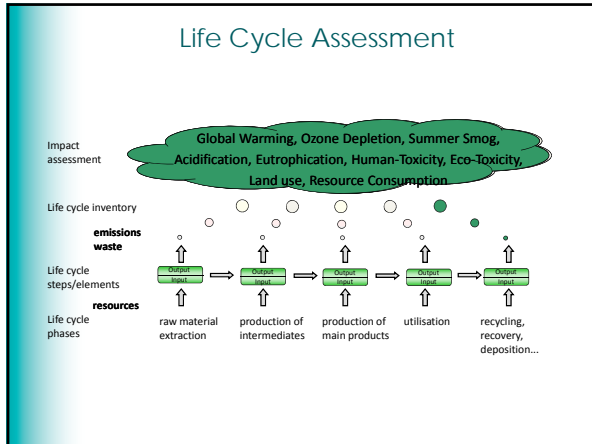
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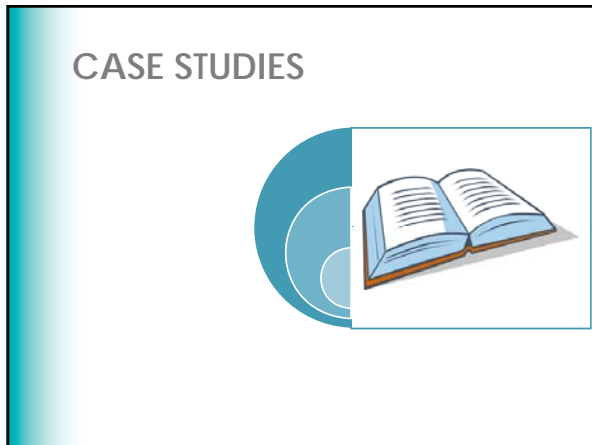
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### Water: Tools & Processes

- REFA – German organisation specialising in time and motion study and process management
  - Live trial at a hospital in Switzerland
  - Comparison of velcro microfiber mopping system & cotton mop
  - Double the m<sup>2</sup> achieved



- 49% H<sub>2</sub>O
- 50% Energy
- 50% Chemicals
- 50% CO<sub>2eq</sub>
- 50% Costs

*"Microfiber system is recommended from an environmental perspective".* – REFA

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### Waste: Concentrated Cleaning Products

- 4 Care homes + 1 office site
  - 100-150 guests per site
- Moved from 1L ready-to-use to highly concentrated cleaning products



Category	Value
Before	30720
After	2304



- 28,416 L H<sub>2</sub>O
- 95%
- 99%
- 95% CO<sub>2eq.</sub>
- 20%

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### Procurement: Hydrogen Peroxide Based Disinfectants

*Tough on pathogens – not on people, surfaces or the planet.*

- Cost Efficiency
  - Reduces cleaning solution consumption by **up to 50%**
  - Increases labor efficiency by **up to 50%**
- Performance, Health and Safety
  - Kills a wide variety of bacteria and viruses + effective clean
  - Does not cause respiratory irritation
  - Does not contain perfumes or dyes
  - Can be used on a wide range of surfaces – Wool-safe approved
- Environmental Responsibility
  - Contains ingredients that readily break down into oxygen and water
  - Does not contain VOCs or Alkylphenol Ethoxylates (APEs)
  - Available as a concentrated that can be diluted at the point of use, meaning less packaging and less chemical miles




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### Energy: Low Temp Laundry

- New system implemented in >1,000 healthcare sites
- Low temperature detergent and oxygen bleach
- Reduced wash temperatures
- Fewer rinses
- Reduced fabric damage

- 30% Water
- 35,500 Mwh
- 9.4 million kg CO<sub>2eq.</sub>
- 20% Cost

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Sustainability Frameworks

- Green Guide for Healthcare  
<http://www.gghc.org/>
- Sustainability Roadmap for Healthcare  
<http://www.sustainabilityroadmap.org/>
- Practice Greenhealth  
<https://practicegreenhealth.org/>

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Thank You

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