

The Impact of Economic, Technological and Environmental Changes on Winter Maintenance Operations Plans and Policies: Adapting to the “New Normal”



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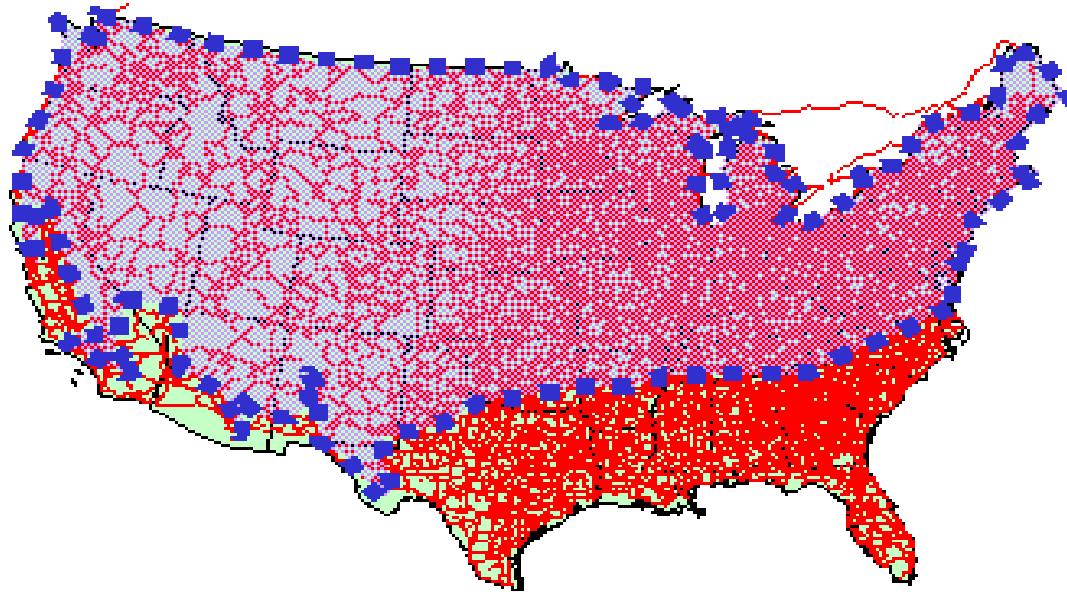
Learning Objectives:

- Recognize the major factors that significantly influence winter maintenance operations.
- Determine the potential impact of each.
- Develop a plan for addressing these challenges.



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Over 70% of U.S. roads and 70% of population are in the region with 5" or more of annual snow and ice.



Source: FHWA Road Weather Management Program website

Note: Over 65% of roads are maintained by local jurisdictions.

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Effects

- Expectations by public remain high.
- 70% of goods move by truck; delays cost in billions annually.
- Crashes (injuries, fatalities, property damage).
- Hinders emergency services and utilities.
- Disruption of normal life for millions.



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Winter road maintenance accounts for:

- 20 percent of state DOT maintenance budgets.
- State and local agencies spend over \$2.3B annually on this.
- Millions of dollars spent annually to repair infrastructure damaged by snow and ice.

ref: FHWA Road Weather Management Program, Snow and Ice



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Factors that affect agencies' winter maintenance operations:

- Climate
- Regulatory Mandates
- Economic conditions
- Workforce
- Technology



Changes create a “New Normal” that agencies must anticipate, assess, adjust, adapt to and act upon.

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Economic

- Maintenance Operations chronically underfunded.
- Great Recession 2007-2013 worsened the situation:
 - much maintenance deferred
 - severe reductions in staffing
 - cut-backs in operating funds
- Uncertainty as to strength of national economy .
- Intra-agency competition for limited funds.



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Workforce Demographics

- Wave of “baby boomer” retirements; loss of knowledge.
- Many younger workers not interested in these jobs.
- Competition from other sectors.
- More stringent screening reduces field of candidates.
- Difficulty achieving diversity.



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Technological

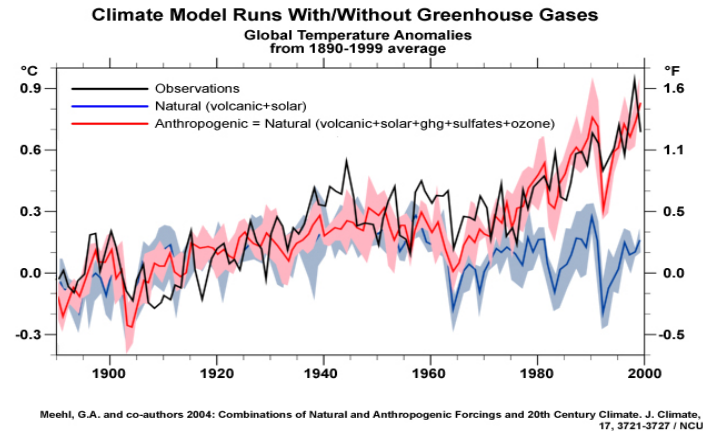
- Improved materials and application knowledge.
- Vehicles and equipment
 - Spreader bodies, applicators and controllers
 - Plow configurations and blade compositions
- Weather forecasting.
- Surface condition monitoring.
- Work Management Systems.
- Communications including AVL/GPS.



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Environmental Influences

- Climate Change
 - Trend of more extreme weather events.
 - Winter events include snow, ice, floods.
 - Periodic anomalies or long-term?
 - Sustainability a concern.
- Regulatory Factors
 - Emphasis on salt and abrasives reduction.
 - Scrutiny of other materials used in winter operations.
 - Fuel, emissions mandates for vehicles.
 - CDL and DOT requirements for operators.
 - Workplace safety and health.



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So What To Do Now?

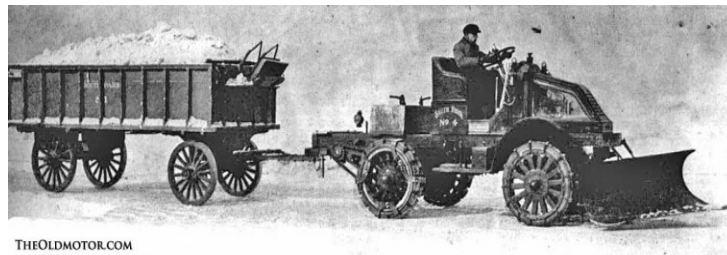
- Are policies, plans, procedures, processes and practices reflective of current situations?
- Are resources sufficient to meet expectations?
- If there is a shortfall or gap what are the options?
 - Acquire more resources
 - Use existing resources more efficiently
 - Adjust expectations
 - Ignore and continue as always.



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Agencies continue outdated practices due to “institutional inertia”.

- Employees resist change. Lack of good information.
- Management indifference; concerned more with infrastructure.
- Existing plans and manuals incomplete, obsolete or ignored.
- Plans need to be flexible to meet various circumstances.
- Plans should also incorporate Performance Measures.



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“Know Where You Are and How You Got There ”

Climate

- typical winter temperature and precipitation ranges.
- historical extremes.
- trend or pattern of last 3-10 years.
- Number of discrete events each year is more important than just total of annual snowfall.
- Include those prepared for but did not occur.
- Categorize according to type, intensity and duration.



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Jurisdictional changes over past 10 years

- Total lane-miles
- Traffic volumes and patterns
- Population (resident and work-day)
- Growth (area) and development (land use)

Routes

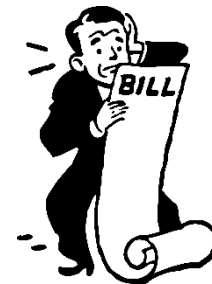
- Levels of Service
- Classifications and numbers
- Lane-mileage per route
- Cycle-time



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Expenditures, annual totals:

- **Materials**, amounts used and costs by type
- **Personnel**, hours and pay(regular and OT)
- **Contractor** hours/ costs
- **Vehicle/ equipment** miles/hours; rental costs
- **Fuel** and other vehicle operating supplies
- **Equipment** maintenance, repair, replacement
- **Clothing and PPE** issued to employees
- **Facilities** costs for utilities, repairs; temporary lodging
- **Communications** and data services costs and charges



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- **Include costs of:**
- **cleanup** such as street sweeping after storms.
- **repairs** to damaged pavement, bridges, sidewalks, traffic control devices, roadway lighting, guardrail, etc.
- **claims /settlements** paid for damage to private property and injuries to citizens.
- **worker compensation** payments



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- **Analyze** the information:
 - Accurate
 - Complete
 - Timely
- **Assess** Challenges vs. Capabilities
 - Potential risks, vulnerabilities
 - Current and expected resources
 - Levels of Service



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WINTER STORM HAZARDS IN THE U.S. ANNUAL MEAN SNOWFALL

Alaska

- Heavy snow
- Strong winds/Blizzards
- Coastal flooding
- Extreme cold
- Avalanches
- Ice jams
- Ice fog



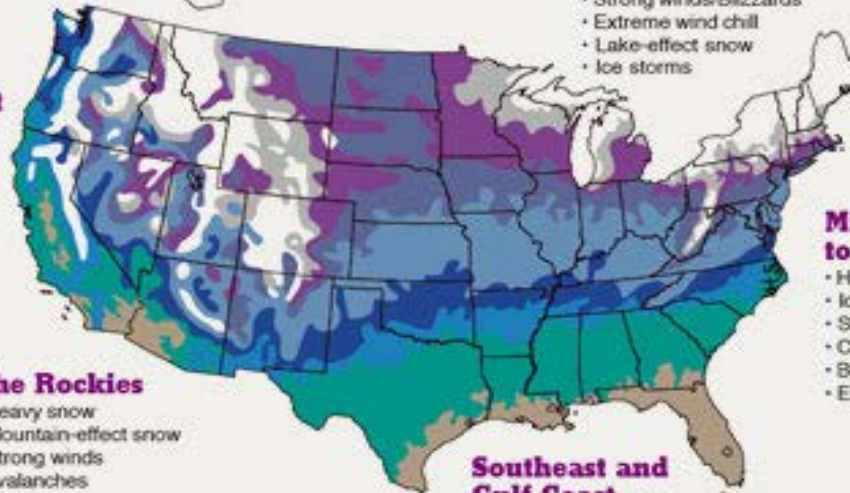
ANNUAL MEAN SNOWFALL

Midwest and Plains

- Heavy snow
- Strong winds/Blizzards
- Extreme wind chill
- Lake-effect snow
- Ice storms

The West Coast

- Heavy precipitation
- High winds
- Coastal flooding
- Beach erosion



Mid-Atlantic to New England

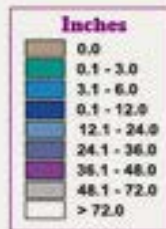
- Heavy snow
- Ice storms
- Strong winds
- Coastal flooding
- Beach erosion
- Extreme cold

The Rockies

- Heavy snow
- Mountain-effect snow
- Strong winds
- Avalanches
- Extreme cold
- Blizzards

Southeast and Gulf Coast

- Ice storms
- Crop-killing freezes
- Occasional snow



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Goal: Maximize Resource Allocation

- includes personnel, vehicles, equipment, materials, etc.
- assess condition, capability and availability
- match with desired LOS
- based on objective, measurable factors
- adjust to fill gaps



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Achieve Key Objectives:

- Effectiveness
- Efficiency
- Equitability
- Consistency
- Continuity



“Know Where You Want to Go Before You Get There”

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Define Level Of Service:

“Desired, normally achievable condition of road surfaces at different times during and after typical winter events.”

- Core of winter operations planning.
- Varies according to priority classifications.
- Dependent upon available resources.
- Contingent upon conditions.
- No standard definitions of LOS.
- Each agency determines its LOS.



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Route Optimization:

Existing routes may be inefficient due to changes in:

- lane-miles
- Cycle-times
- classification and priority of streets
- Levels of Service
- traffic volumes and/or patterns
- traffic control systems
- material selection and application rates
- plowing and spreading methods
- fleet capability
- Major construction, detours, closures



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Plan for Contingencies:

- Ice storm debris clearance
- Intense/ excessive snow rate
- Increased accumulations from successive storms
- Shortage of material
- Shortage of usable vehicles
- Shortage of personnel
- Communications failures
- Loss of facilities
- Flooding caused by ice-jams
- Emergencies



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Summary

- Anticipate---”scan the horizon “ and identify challenges.
- Assess--- determine the impact based on current capabilities.
- adjust --- plans, policies, procedures, processes and practices.
- Adapt--- be flexible as situations dictate. Continually monitor.
- Act---implement changes in operations.
- Resource allocation can improve operational capability.
- Data must be accurate, complete, timely.
- Develop relevant, objective performance measures.
- Document, document, document.



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