Geofoam Research Consortium Participants

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EPS Consortium Consulting and Design Experience

- All members have twenty years of experience consulting, designing, and construction in the following regions and countries

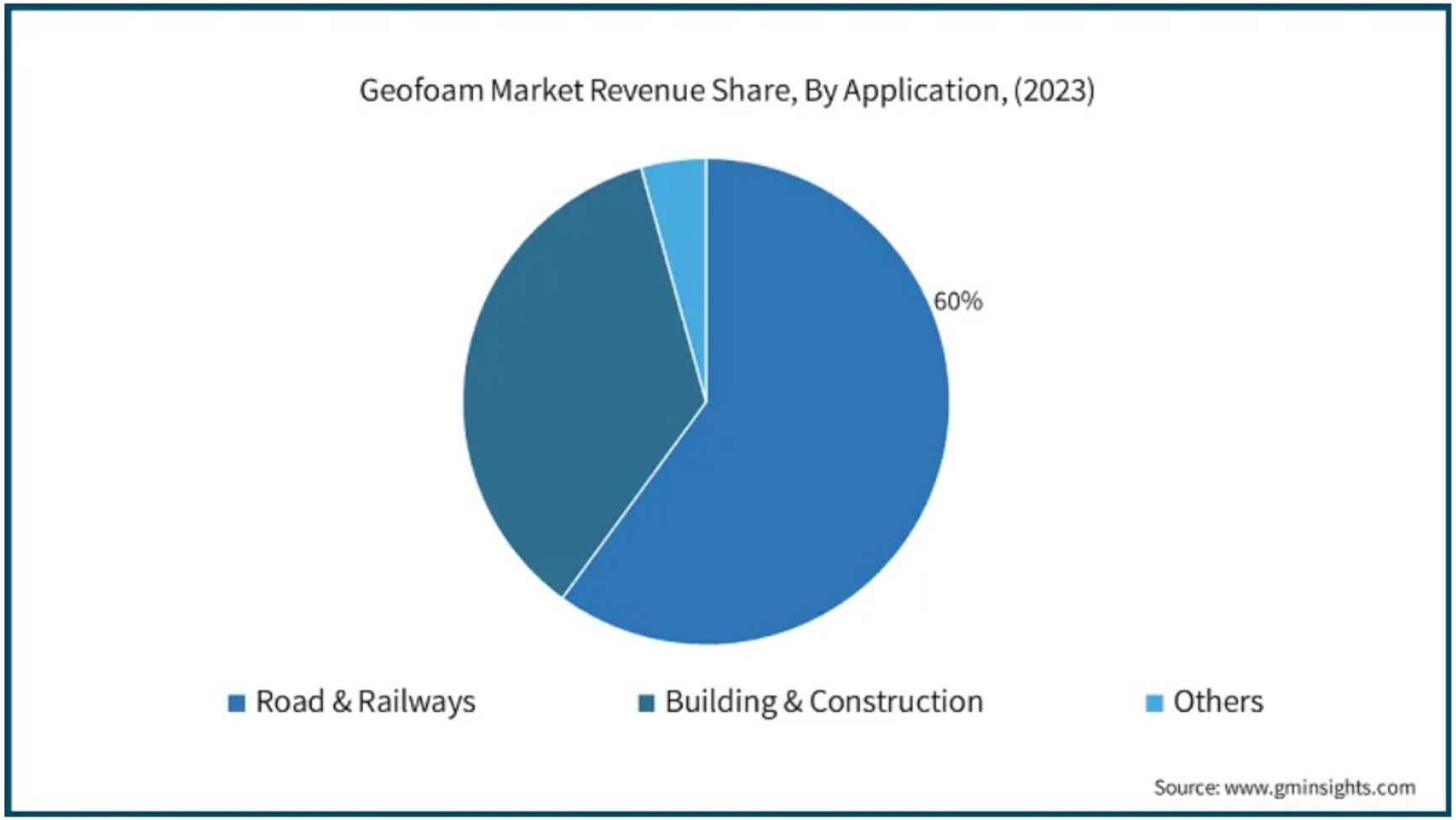
- Northern Europe
- Japan
- U.S.
- Mexico
- China
- Taiwan
- The Republic of Korea
- Philippines
- Turkey
- Saudi Arabia
- India

EPS Geofoam Development History

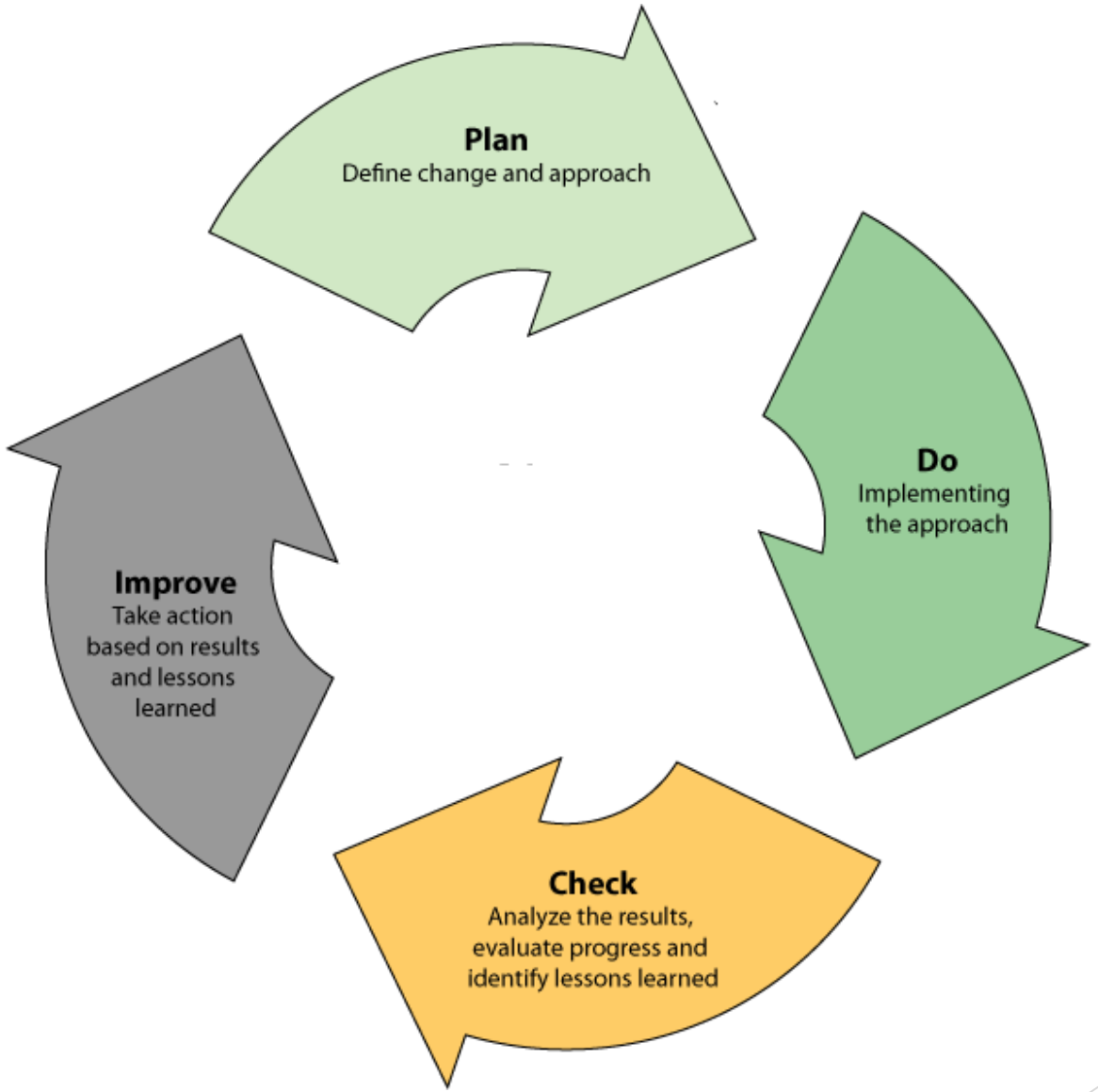
- 1972 – Norway - First EPS Embankment – Flom Bridge
- 1985 – Norway - First International EPS Conference held in Oslo
- 1986 – Japan - Establishment of EPD Development Organization (EDO) EDO signed a technology agreement with the Norwegian Public Roads Administration
- 1989 – U.S. - First Geofoam Project, Slope Stabilization in Colorado
- 1996 – Japan - Second International EPS Conference held in Tokyo
- 1998 – U.S. - I-15 Reconstruction Project, Salt Lake City, Utah (World's Largest)
- 2001 – U.S. - EPS embankment constructed in Boston as part of Big Dig Project
- 2001 – U.S. - Third International EPS Conference held in Salt Lake City, Utah
- 2011 – Norway - Fourth International EPS conference held in Oslo
- 2018 – Cyprus Turkey - Fifth International EPS conference held in Istanbul

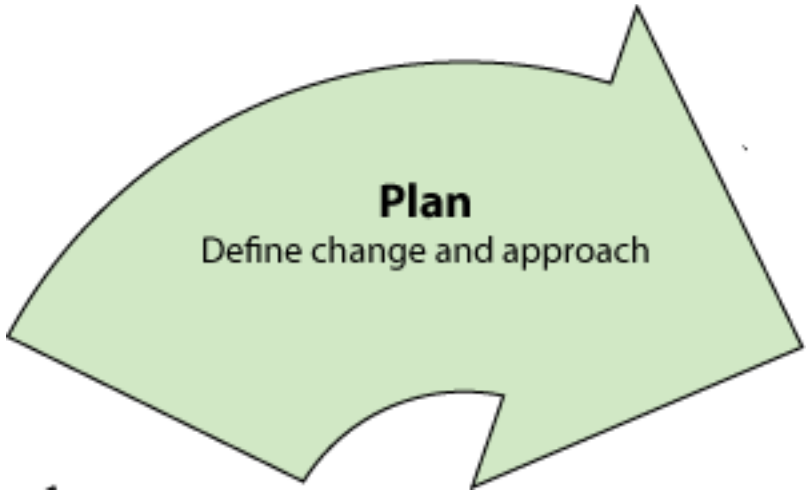
Overview of Key Strategies and Points

- Transportation engineering is the most important and largest market
  - Establish relations with owners (Dept. of Transportation), designers, contractors, regulators, and other suppliers
- Develop partnerships (commercial, engineering, and research)
  - Outreach and educate the above groups
- Geofoam should be marketed as an engineered system, not a commodity
  - Geofoam is not a replacement for common, compacted fill
  - There must be a strong rationale (technical basis) for use
  - Project-specific design may be required based on geotechnical soil conditions
- Small and moderate-size projects are important markets
  - Architectural, green roof, and landscaping constitute relatively stable markets
- Promote geofoam benefits
    - Rapid construction (time reduction)
    - Ease of construction
    - Cost savings and reduced environmental impacts
- Block molders must sell a certified geofoam product
  - QA/QC program
  - Certification branding of the EPS product
  - Fire and insect inhibitors
- Assist government officials in the adoption of standards and specifications
  - European and U.S. standards and specifications already exist and can be adapted to local practice in other countries

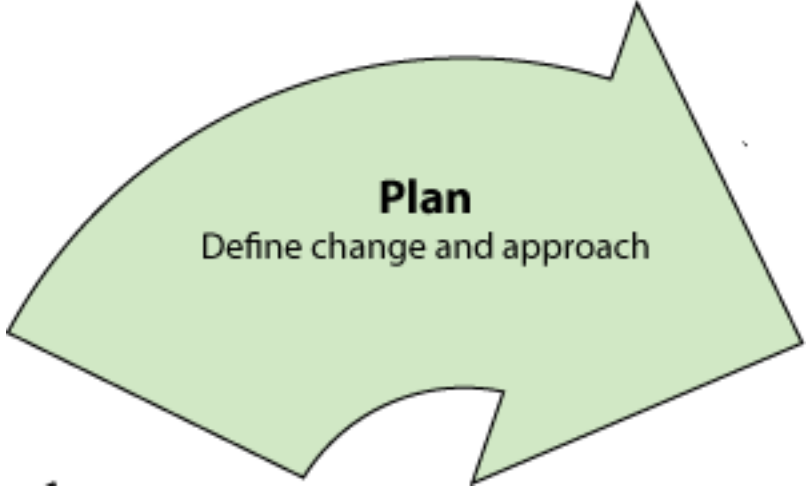

Geofoam Market Revenue Share, By Application, (2023)
60%
Road & Railways
Building & Construction
Others
Source: www.gminsights.com

Implementation Steps of EPS Technology

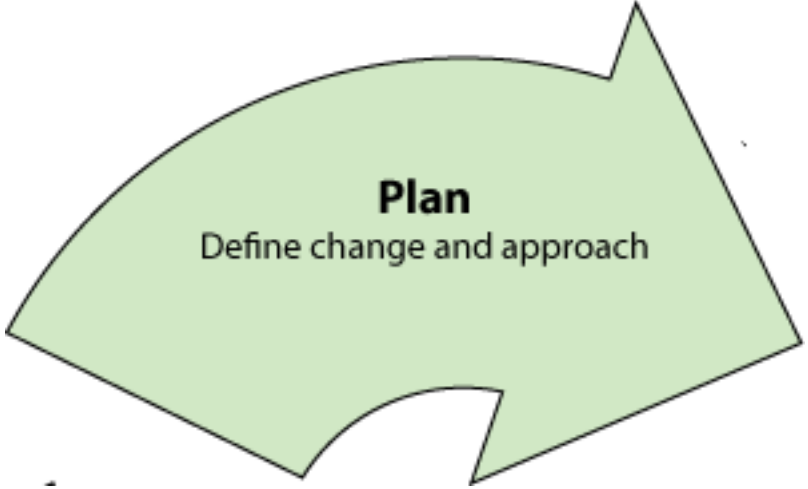




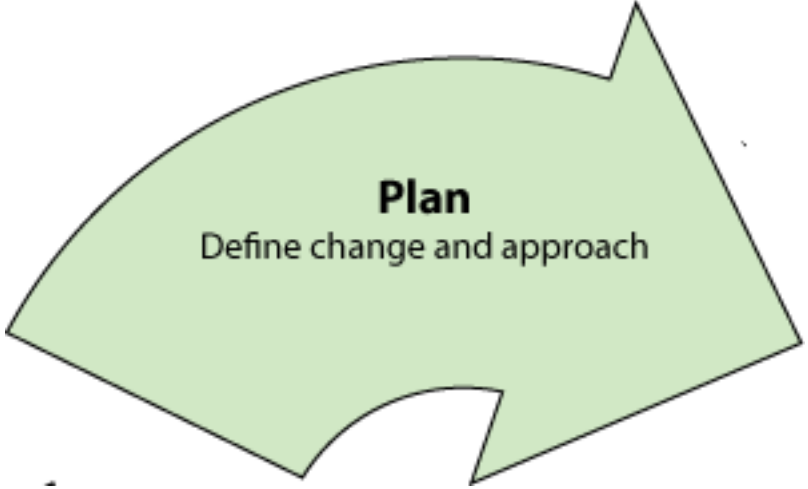
- Research and Development
- Education and Outreach
- Workforce Development
- Develop Design Methods and Guidance
- Standard Specifications
- Vendor Prequalification



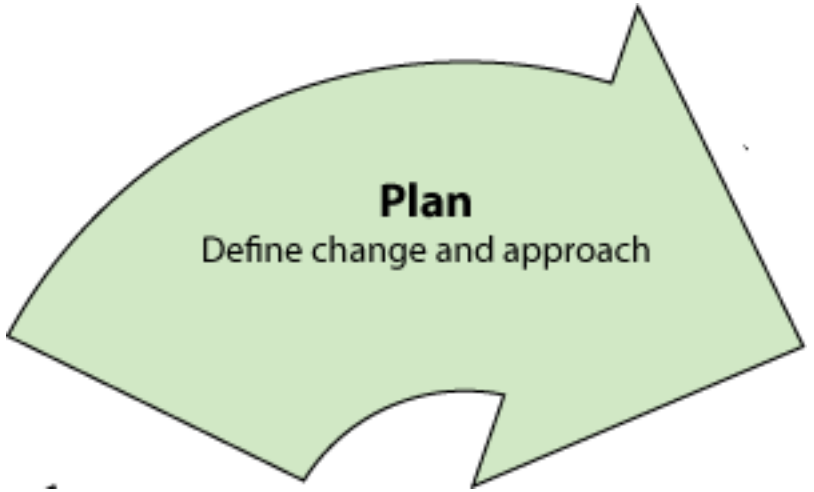
- Research and Development
  - Norwegian Public Road Administration (1972)
  - EPS Construction Method Development Organization (EDO) – Japan (1986)
  - German Institute for Road and Transport Research (1991)
  - Delft University – Netherlands (1997)
  - USA Geofoam Research Institutions
    - Syracuse University
    - University of Utah
    - University of Illinois
    - University of Memphis
    - Manhattan College



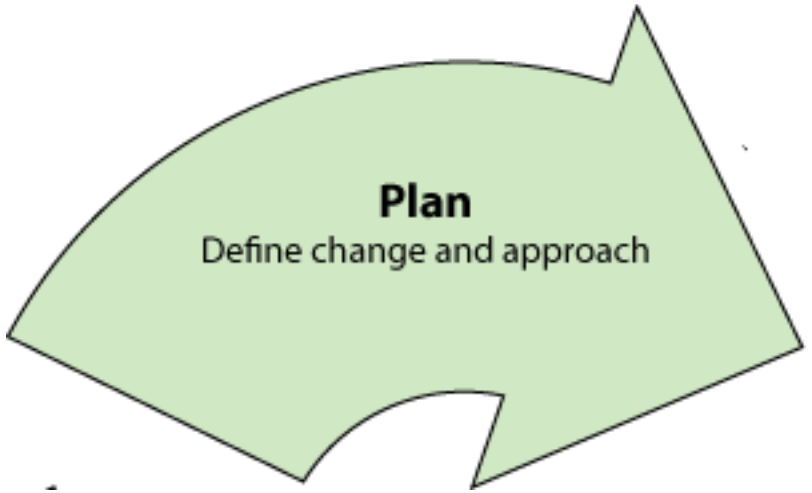
- Education and Outreach
  - International Conferences
    - 1985 – 1st International Conference (Oslo, Norway)
    - 1996 – 2nd International Conference (Tokyo, Japan)
    - 2001 – 3rd International Conference (Salt Lake City, USA)
    - 2011 – 4th International Conference (Oslo, Norway)
    - 2016 – 5th International Conference (Istanbul Turkey?)
  - Technical Seminars (Professional Meetings and Societies)
  - Informal working meetings
  - Skype conferencing with potential clients
  - Papers and technical reports



- Design Methods and Guidance
  - Norwegian Public Roads Administration (1987, 1992, 2002)
    - 2002 Lightweight filling materials for road construction – NPRA Publication No. 100)
  - Japanese Practice – EDO (1996, 2001)
    - In Japanese
  - USA - NCHRP 529 and Web Document 65 (2004)
  - European EPS White Book (2011)
    - EUMEPS Background Information on standardization of EPS
  - USA - NCHRP Project 24-11(02) Phase I Study (slopes) (2011)
  - USA - Expanded Polystyrene (EPS) Geofoam Applications & Technical Data",
  - The EPS Industry Alliance, Crofton, MD (2012)

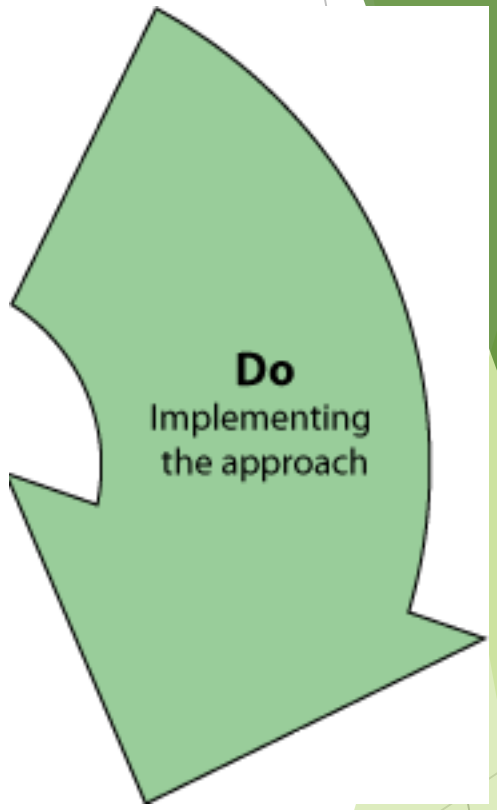


- Standard Specifications
  - Material
    - ASTM D6817 (USA)
    - Thermal insulation and lightweight fill products for civil engineering applications. Factory-made products of expanded polystyrene (EPS White book and EN 14933) (Europe)
  - Transport, Handling, Storage
    - NCHRP 529 (USA)
  - Construction
    - NCHRP 529 (USA)
  - Quality Assurance / Quality Control
    - NCHRP 529 (USA)

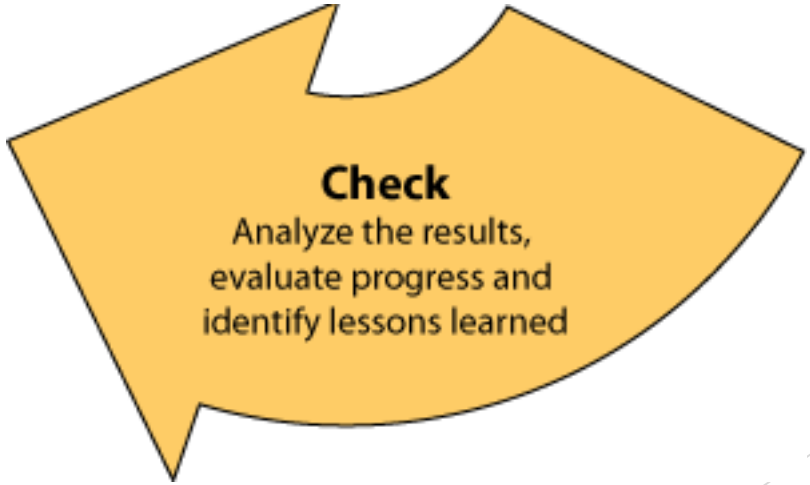


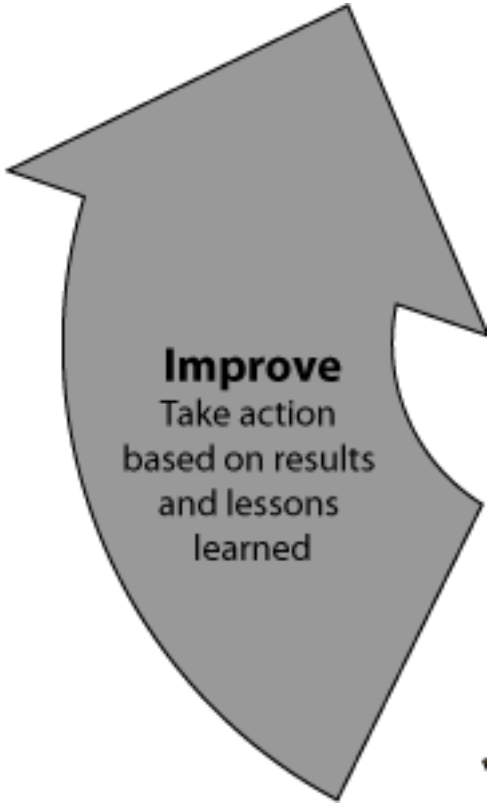
- Vendor/Supplier Prequalification
  - Ensures quality of product
  - Development of quality assurance/quality control program
    - Independent laboratory verification
      - Certification of product
  - Certification of production capacity

- Selection of Demonstration Project
- Performance Requirements
    - Settlement tolerances, deformations, acceptable factors of safety, construction time, sequencing, etc.
- Conceptual Design
- Selection of Preferred Alternative
- Final Design
- Costing Estimate and Schedule
- Selection of Contractor
    - Selection of prequalified EPS Vendor
- Construction
    - Material manufacturing
        - Product Acceptance
        - Quality control testing and records
    - Transportation
    - On-site storage/stockpiling
    - As-built drawings
- Project Finalization (Acceptance)



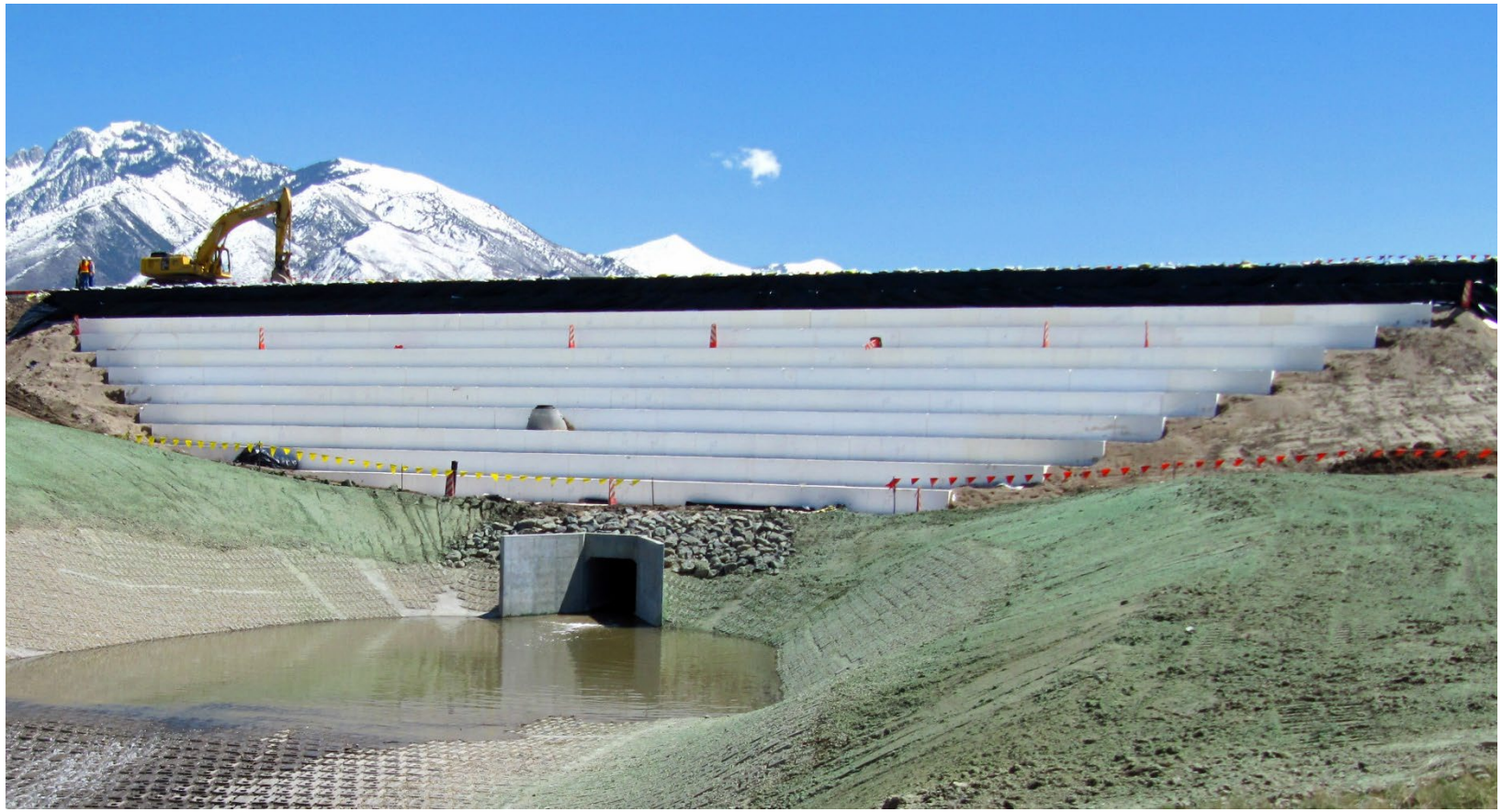
- Performance Monitoring
  - •Verify the performance of the geosystem and design
  - • Implement field monitoring and instrumentation
    - • Foundation deformation monitoring
      - • Primary Consolidation Settlement
      - • Horizontal movement (slopes)
      - • Creep
    - • Geofoam
      - • Construction movement
      - • Long-term creep
      - • Stresses, horizontal and vertical
      - • Horizontal movement (slopes only)





- Evaluate construction
- Evaluate design
    - Verify against performance goals
        - settlement tolerances
        - deformations
        - schedule
        - cost
- Evaluate constructability
- Recommend actions based on lessons learned
- Revise design guidance, specifications, etc, based on findings

Questions



For more information, see

https://my.civil.utah.edu/~bartlett/Geofoam/