International Geosynthetics Society

# Geosynthetics: A sustainable solution for water management in canals

15th November 2021

Nathalie Touze



IGS Vice President, Dr. Touze has been conducting research on geosynthetics for the past 27 years, with particular emphasis on hydraulic and environmental applications. She is the head of the INRAE center at Jouy-en-Josas-Antony, a French public research institute, which has been at the forefront of geosynthetic research since 1972. She has authored about 200 papers and serves or has served on a number of national technical committees especially for the use of geosynthetic clay liners and geomembranes. Her experience has been acknowledged in the field of standardization and she has served as convenor of WG4 (hydraulics) in ISO TC 221 and CEN TC 189. She is the immedaite past-president of the council of the French Chapter of IGS. She has been elected on the IGS council twice (2010-2014 and 2014-2018). Dr Nathalie Touze was a Keynote Lecturer at the Eurogeo 4 and Eurogeo 5 conferences. She was also an invited lecturer at the 7th International Conference on Environmental Geotechnics in 2014 (Melbourne, Australia) and was awarded the 6th Giroud Lecture, that was presented along the 11th International Conference on Geosynthetics in Seoul, Korea, in 2018.

Improving the Performance of Canals with Geosynthetics – IGS Technical Committee on Hydraulics – November 15-17, 2021

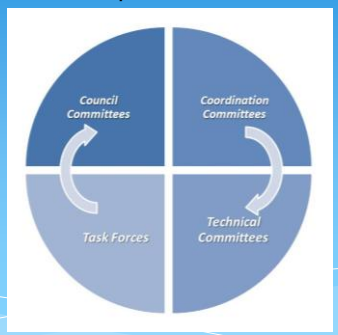
# The International Geosynthetics Society

The IGS is a learned society dedicated to the scientific and engineering development of geotextiles, geomembranes, related products and associated technologies.

## Mission Statement (Est. 2010)

Est. 1983

The core purpose of the IGS is to provide an understanding and promote the appropriate use of geosynthetic technology throughout the world.

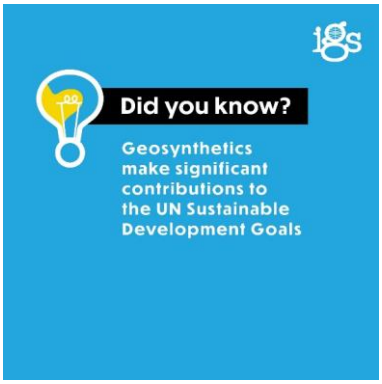




## Vision (Est. 2018)

The vision of the IGS is that geosynthetics be recognized to be fundamental to sustainable development by providing technological and engineering solutions to answer societal and environmental challenges.

www. geosyntheticssociety.org





https://www.geosyntheticssociety.org/sustainability/

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Did you know?

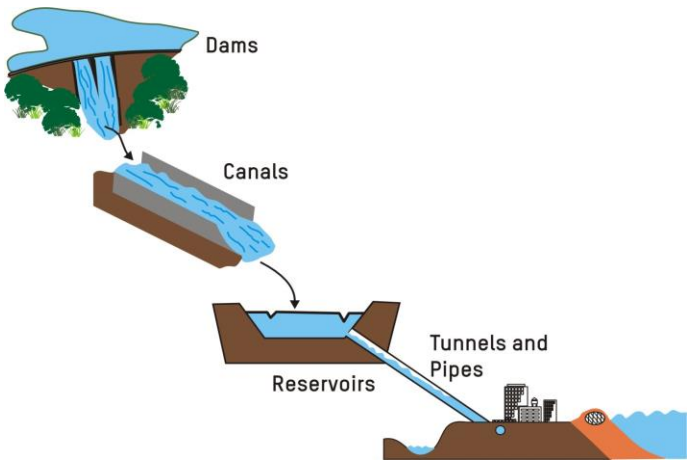
**Did You Know… geosynthetics make significant contributions to the UN Sustainable Development Goals?**

- Unequalled solutions are possible
- Surface and groundwater is preserved and safeguarded from contamination
- Sustainable techniques ensure the reduction in energy consumption and emission
- Other construction materials can be replaced or reduced
- Economic growth and welfare is enabled

**Geosynthetics provide both Environmental and Economic benefits**



# Freshwater water cycle with geosynthetics




Geomembranes hold the key via their use as barriers in those applications

Adapted from Koerner et al. 2008

# Joint Environmental and Economic benefits



# Common misconception that sustainable solutions for infrastructure will cost more, but:

**Geosynthetics solutions were developed to provide financial benefits**

- Easier and or accelerated construction
- Immediate usability
- Long term savings in relation with extending life by increasing volume (reduced thickness, increased stability on slope)


**Energy savings and environmental benefits then became obvious**

- Reduction in emissions
- Reduction in energy consumption
- Reduction of the quantity or need for select soil material
- Less long-term maintenance associated with significant contribution to the lifespan

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* **Reduction in emissions**

## Geosynthetics are designed for long term use

### Durability of exposed geomembranes

- Theservice life of PVC-P composite geomembranes exceeds 50 years
- Good behavior of exposed HDPE, PVC-P, EPDM geomembranes in climatic conditions representative of the Canary Islands 20 to 30 years after installation
- Good behaviour of exposed elastomeric bituminous geomembranes and covered oxidized bituminous 30 years after installation
- The lifetime of geomembranes is increased by covering them

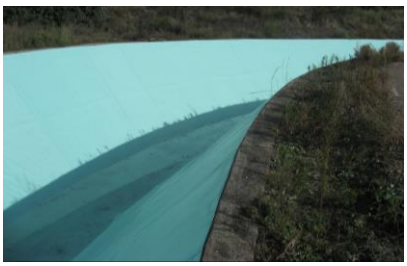
PVC-P composite geomembrane, Cignana dam, courtesy D. Cazzuffi

HDPE geomembrane, La Mericana reservoir (courtesy M. Blanco)

# Effectiveness of canals after 10 years in service

Defined as the reduction of seepage losses compared to unlined canals

| Type of canal | Percentage |
|---|---|
| Lined with concrete | 70 |
| Lined with geomembrane | 95 |

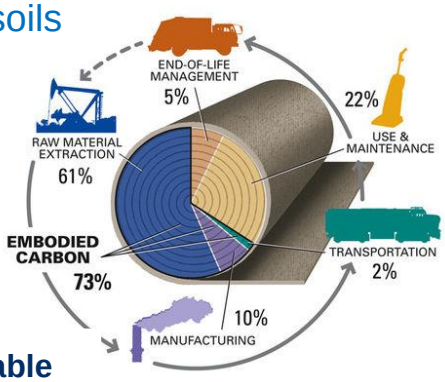




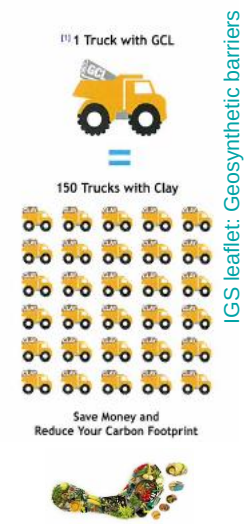
# Mitigation of climate change by use of geosynthetics

Geosynthetics contribute to a reduction of GHG emissions from construction compared to soils

Embodied carbon (EC) is an indicator of cumulative carbon emissions used in the solution adopted




**All published studies to date conclude that solutions with geosynthetics are more sustainable than alternative solutions using soil or concrete based on embodied carbon**




IGS leaflet: Geosynthetic barriers

# Societal benefits



## Economic growth and welfare is enabled

Use of geosynthetics

Financial benefits

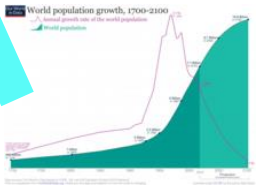
More money available

Infrastructure, Healthcare, education

Healthier better educated and efficient people

Reduction in population (Norberg, 2017)

Positive impact on climate change and use of resources

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## Summary


- Geosynthetics make significant contributions to the 17 SDGs of the United Nations by their use in applications that serve in food production, environmental protection, infrastructure, mitigation of natural disasters, etc
- Geosynthetics solutions also contribute to make significant economic savings thus impact positively the economic growth and the reduction of inequalities
- Geosynthetic solutions minimize resource and energy consumption and emissions, in relation with their unequalled performance whether intrinsec to the products or to the transportation and installation processes



# Thank you for your attention

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