



International Geosynthetic Society

PREPARING THE GROUND FOR A BRIGHTER FUTURE

HOW GEOSYNTHETICS HAVE BEEN SERVING
SOCIETY FOR HALF A CENTURY



GEOSYNTHETICS: A FORCE FOR GOOD

Geosynthetics are not only a great engineering invention; they are a great human invention too.

Society as a whole benefits from the effective use of geosynthetics. Geosynthetics contribute to more efficient agriculture, the prevention of water contamination, the protection of coastal areas, and safety within the vital transportation we all rely on.

Using thoughts from the 2018 Giroud Lecture: *Healing The World: A Geosynthetics Solution*, by Dr Nathalie Touze, this eBook will demonstrate how geosynthetics are helping to tackle some of the world's biggest challenges:

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This eBook will also provide insight into the IGS and the shared values of its organization.



FEEDING THE WORLD

Agriculture occupies between 40 and 50% of the Earth's land surface. As the world population grows, demand increases. Between 1961 and 2009, agricultural production increased by 300%; it now accounts for up to 12% of total anthropogenic greenhouse gas emissions, 50% of methane emissions and 60% of global nitrous oxide emissions.

With the global population predicted to break 10 billion by 2100, increased agricultural efficiency and the control of harmful gases from agriculture operations is vital for a healthy world.

Geosynthetics for agriculture:

- Protect against soil erosion, including via coir and jute geotextiles which degrade and, in jute's case, prevent pesticides from releasing into irrigation water
- Protect drainage pipes, helping farmers maintain suitable water saturation and soil stabilization
- Act as ground cover to:
 - Control the growth of crops. Nonwoven geotextiles can allow the free flow of water, air, fertilizer and nutrients, while providing an environment that prevents oversupply and accelerates crop growth
 - Protect against pests and excessive wind and sun during growth and storage
- Stabilize and protect land, preventing injury to animals
- Reduce seepage, prevent bank erosion and improve water quality in fish farms
- Manage and prevent contamination from animal waste and methane
- Act as waterproof barriers in the creation of urban agriculture environments

VIRTUALLY ALL EMISSIONS ATTRIBUTED TO AGRICULTURE ARE THE RESULT OF FOOD PRODUCTION TO FEED AN EVER-GROWING WORLD POPULATION, WHICH IS ESTIMATED TO INCREASE BY OVER 50% TO 10.8 BILLION BY 2100.

Porter and Reay 2015

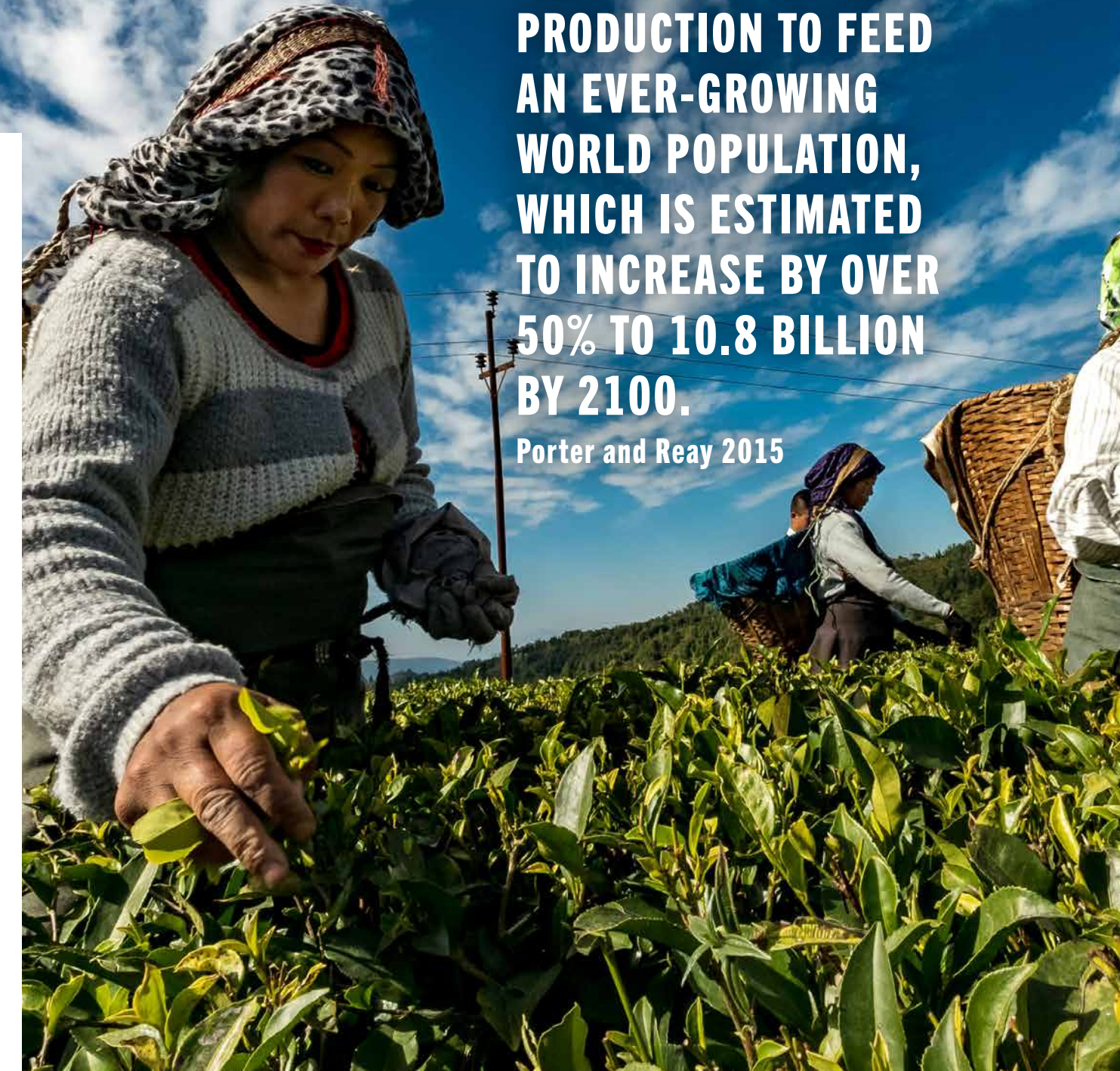


Image: BBH Singapore \ Unsplash

QUALITY WATER FOR ALL

Water scarcity is a global scandal. In 2015, the United Nations revealed two fifths of the world's population was affected by water scarcity; a figure the UN expects to rise. Contamination, the threat of climate change and the appalling conditions within 'thirst belts' threaten whole communities.

The solution lies in greater control over the storage and distribution of water. Geosynthetics can play an integral part in achieving this aim.

GEOSYNTHETICS, MAINLY GEOMEMBRANES, HOLD THE KEY TO THE CAPTURE, TRANSPORTATION, STORAGE, AND DISTRIBUTION OF FRESHWATER VIA THEIR USE AS BARRIERS FOR DAMS, CANALS, RESERVOIRS, AND PIPELINES.

Koerner et al. 2008

Geosynthetics help prevent water scarcity:

- By increasing agriculture efficiency, as described on the previous page
- By stopping leaks when geomembranes are used as lining and waterproofing for canals – geomembrane linings have been shown to leak less than 10 times that of cement concrete linings
- By aiding water conveyance in hydraulic tunnels
- By preserving water quality and supply by preventing contamination when used for lining and covering reservoirs
- And, less water is required to produce geosynthetics; the concrete industry is the second largest water consumer after agriculture

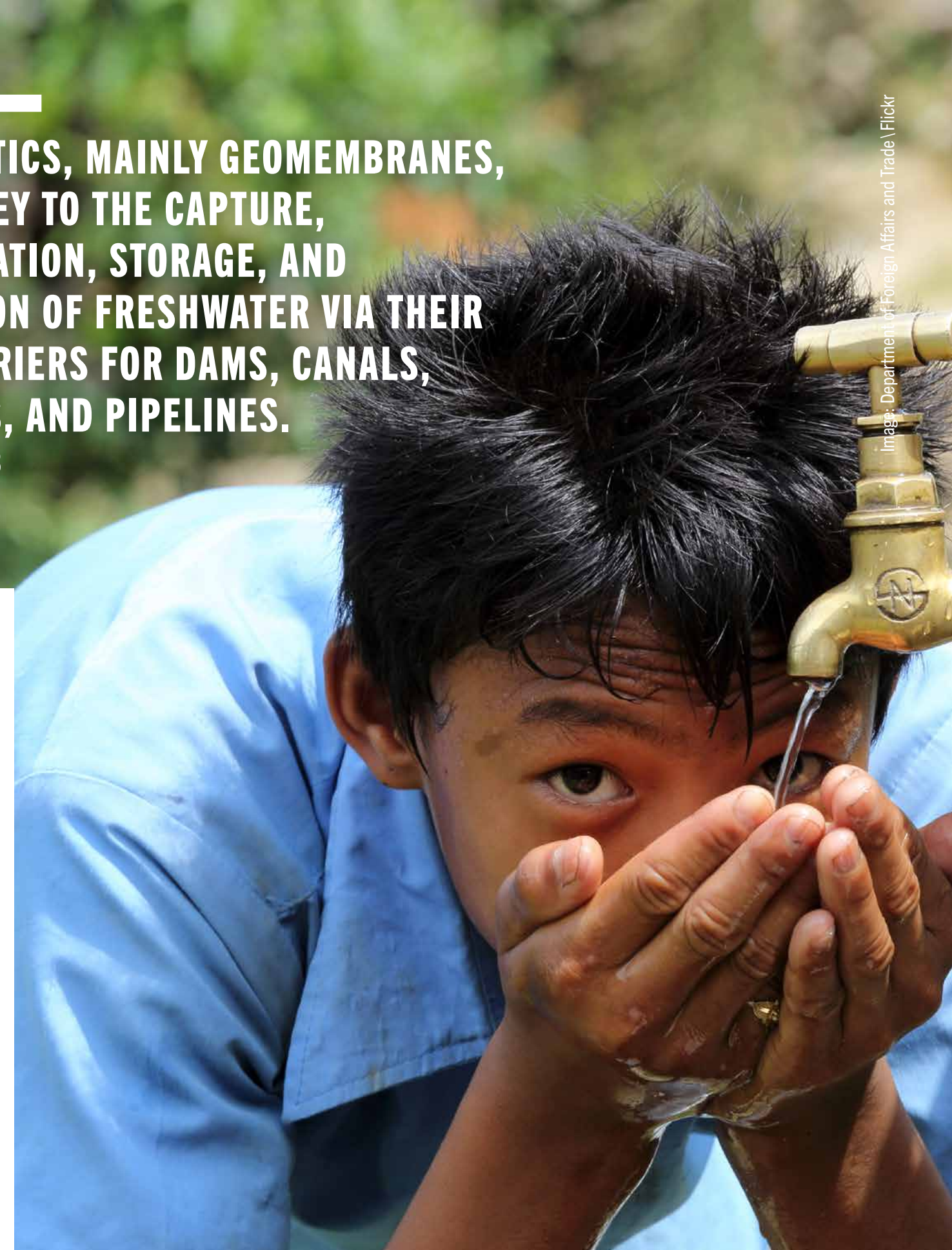


Image: Department of Foreign Affairs and Trade / Flickr

NATURAL DISASTERS

THE FACT THAT NATURAL DISASTERS ARE UNAVOIDABLE DOES NOT MEAN THAT NOTHING SHOULD BE DONE TO MITIGATE THEIR CONSEQUENCES.

Brandl 2010, Yoo 2015

Flooding, landslides and droughts can all cause death and devastation. And as the growth of human settlements, rapid population acceleration and climate change take hold, the Earth will experience pressures never felt before.

Effective water management using geosynthetics can help prevent human disasters from flooding and drought. Erosion control and water management can also play a vital role in preventing and mitigating flooding and landslides.

Geosynthetics:

- Prevent coastal erosion and help create stable hydraulic energy-absorbing, mass-gravity units that are structurally sound off coastal areas
- Provide a safe off-shore geotextile artificial reef environment for humans while attracting marine plants and life soon after construction
- Protect against flooding as an integral part of rehabilitated and new dams, act as horizontal or vertical filter separators, reinforcement for dyke defense, surface erosion protection and preventing damage from digging animals
- Provide a short-term flood defense solution utilizing natural and local ballast
- Protect against landslides by preventing ground erosion and strengthening, stabilizing and reinforcing slopes that may be susceptible to earthquakes, high winds or erosion from streams or rivers
- Can work as technical solutions for continuous monitoring during strong climatic events, for example combining geotextiles with fiber-optic temperature measurement capabilities can aid early detection of unstable areas



CONNECTING PEOPLE

In a world where borders are increasingly becoming boundaries, modern, effective transportation infrastructure can break down barriers between languages, cultures and opportunities. A connected world is a greater one.

Whether it's uniting isolated areas to the rest of the world, opening up economic opportunities for previously excluded people, or enhancing productivity by reducing transport times, geosynthetics can help us all come together.

Geosynthetics:

- Aid road construction by separating layers and stabilizing the base of roads and soft subgrades, while ensuring lateral drainage
- Can be used to separate and reinforce layers of railway track-support structure, aiding good drainage, preventing ballast contamination and dissipating stress from the movement and weight of trains
- Help reinforce bridges, ensuring no bumps in the approach and no damage from seasonal thermal expansion or contraction

**INVESTMENTS
IN TRANSPORT
INFRASTRUCTURE
SHOULD HELP REUNITE
PREVIOUSLY ISOLATED
PEOPLE WITH THE
POSSIBILITY OF
SOCIAL MOBILITY.**

Levita 2017

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ECONOMIC DEVELOPMENT

We live in a world full of economic disparity; more than 700 million people still live in extreme poverty today (Norberg 2016). Geosynthetics are used in the creation of transport infrastructure that generates shared economic growth. The use of geosynthetics can herald cost savings at the point of construction too.

Specifying geosynthetics can also provide significant financial benefits, meaning money can be reinvested where it is needed most.

Geosynthetics:

- Generate cost savings by:
 - Reducing the quantity or need for soil material within civil engineering projects
 - Accelerating construction
 - Improving long-term performance, with less requirement for repair and the associated disruption
 - Improving sustainability
- Help generate economic growth as part of wider transport infrastructure investment
- Protect economies by mitigating natural disasters and the resulting economic damage
- Provide significant environmental cost savings from the reduction in material usage, acceleration of construction and reduction in maintenance

THE USE OF GEOSYNTHETICS IN CIVIL ENGINEERING APPLICATIONS OFTEN PROVIDES FINANCIAL BENEFITS BY REDUCING THE COST OF IMPORTED MATERIALS, REDUCING THE AMOUNT OF WASTE, AND GENERALLY PROVIDES MORE EFFICIENT USE OF RESOURCES COMPARED WITH TRADITIONAL SOLUTIONS THAT USE SOIL, CONCRETE, AND STEEL.

Jones 2015

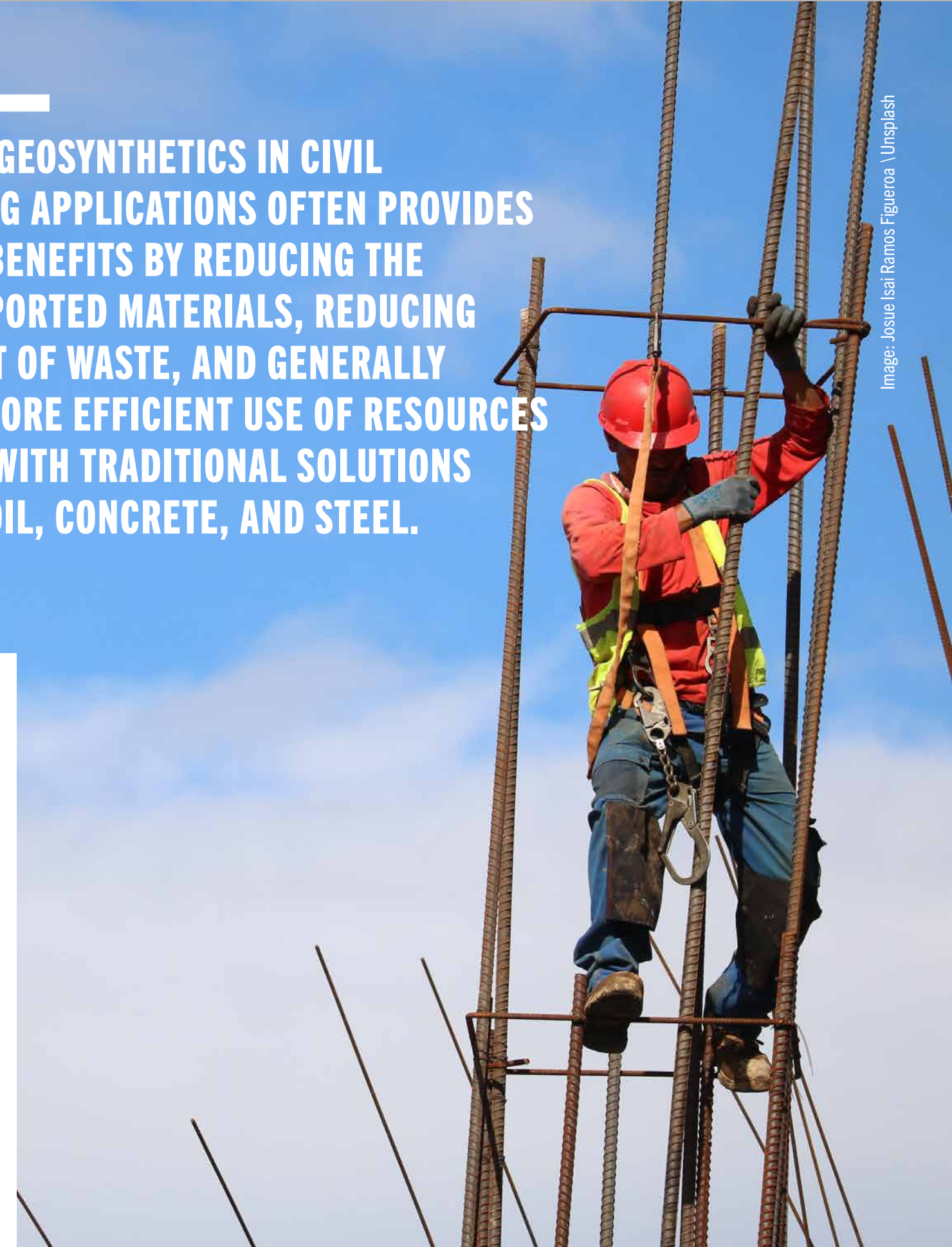


Image: Josue Isai Ramos Figueroa | Unsplash

PROTECTING OUR ENVIRONMENT

Nothing is more sacred than our natural environment. The considered management of waste, sensible and sensitive construction methods and the prevention of water contamination via erosion and infiltration are all essential if our planet is to prosper.

By protecting against contamination both below and above surface, and contributing to ever-improving construction methods with reduced carbon footprints, geosynthetics are at the forefront of helping us to preserve the quality of our environment.

Geosynthetics:

- Prevent contamination from waste when used as liners in landfill
- Prevent water infiltration and gas migration by acting as landfill covers
- Prevent contamination by radioactive waste; following the 2011 earthquake off the Pacific coast of Tohoku in Japan, and resulting damage to the Fukushima Daiichi nuclear power plant, there are 1,600 temporary storage sites using geomembrane liners
- Reduce the environmental risks of mining operations by their usage in lining systems for heap leach pads, tailing storage facilities, waste storage and lining ponds and channels
- Aid wastewater treatment when used as reed-bed filters
- Ensure the dewatering of slurry-like materials during transportation via geotextile tubes
- Help the safe conversion of contaminated land into solar energy sites
- Reduce water contamination during construction projects
- Reduce greenhouse gas emissions from construction projects, by allowing the use of more locally-sourced natural materials within the construction of infrastructure



Image: Marta Ortigosa | Pexels

THE INCREASE IN PRODUCTION AND TRANSPORTATION THAT HAS CONTRIBUTED TO REDUCING POVERTY HAS ALSO RELEASED SIGNIFICANT AMOUNTS OF GREENHOUSE GASES DUE TO ITS DEPENDENCE ON FOSSIL FUELS.

Touze 2020

LIVING TOGETHER: IGS VALUES

It is not enough that geosynthetics provide solutions to society; our industry must act as an example of how to live, work and prosper together.

As an established learned body, the IGS is committed to common values centered around respect for our environment and each other, shared learning, freedom, education and the prevention of harm.

IGS values include:

- Beauty
- Truth
- Justice
- Respect
- Love
- Freedom

WE ARE MORE
INTERCONNECTED
AND INTERDEPENDENT
THAN EVER BEFORE.
CONSEQUENTLY,
OUR INDIVIDUAL
AND COLLECTIVE
RESPONSIBILITY
HAS INCREASED
ENORMOUSLY.

Potočnik 2017



Image: Sebastián León Prado \ Unsplash

ABOUT THE IGS

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

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.

To find out more, visit www.geosyntheticssociety.org



International Geosynthetics Society

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