

# Collaboration for the PFAS-Free Future

*Multi-disciplinary and sector collaboration for the reduction of PFASs in the carpets and rugs and packaging industries*

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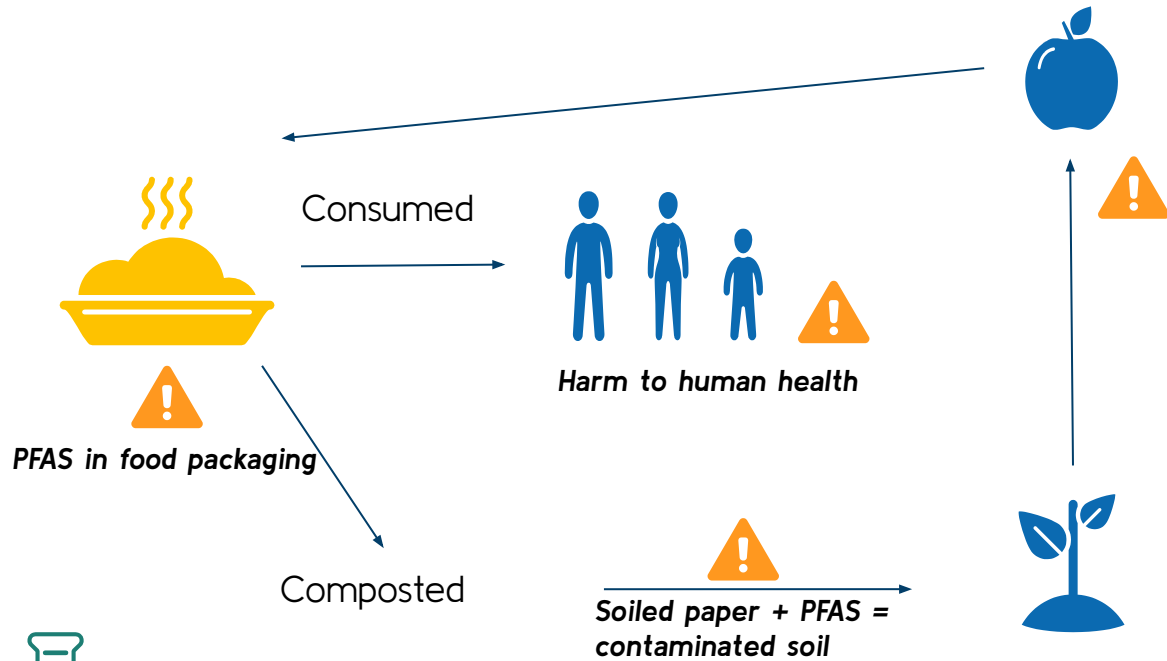
BERKELEY CENTER FOR  
GREEN CHEMISTRY



1. Persistent chemicals of concern are a challenge to the circular economy
2. Collaboration is key to solving that challenge
3. The Greener Solutions program is a model, as shown through four PFAS case studies



# The challenge of hazardous chemicals in the circular economy



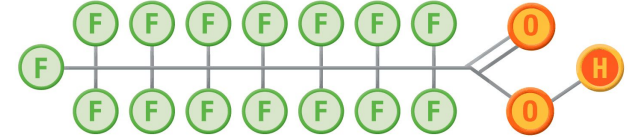
Chemistry and engineering play a vital role in creating a closed-loop economy for a sustainable future

# Per- and polyfluoroalkyl substances (PFASs)

- ▶ Class of thousands of chemicals
- ▶ PFASs are ubiquitous in the environment, plants and animals, human bodies, and drinking water
- ▶ Oleophobic and hydrophobic
  - ▷ Difficult to remove once in system

## PFOA and PFOS chemicals

U.S. manufacturers voluntarily phased out PFOA and PFOS, two specific PFAS chemicals.



## GenX chemicals

GenX chemicals are a replacement for PFOA.

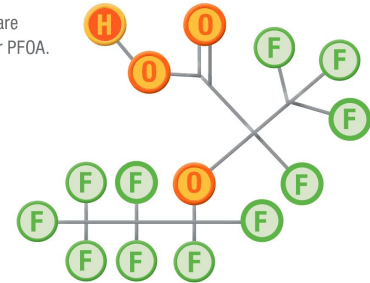


Photo credit: NC Air National Guard

# PFAS Health Hazards

- ▶ Multiple toxicities
  - ▷ Carcinogenicity
  - ▷ Cardiovascular toxicity
  - ▷ Endocrine toxicity
  - ▷ Immunotoxicity
  - ▷ Reproductive toxicity
- ▶ PFASs & degradation, reaction, metabolism products are of concern



# PFAS challenges at a glance



**Aftermarket carpet treatment**



**Carpet recycling**



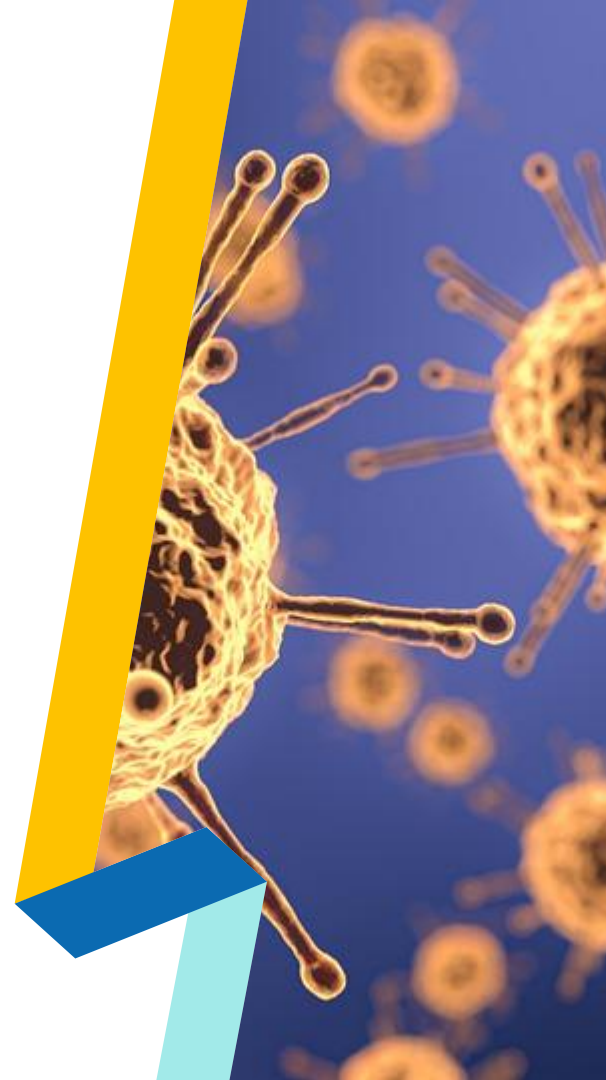
**Food Packaging**



**Product Packaging**

# COVID-19 Implications

- ▶ PFAS exposure and increased risk of more severe COVID-19 effects
- ▶ We are spending more time at home than ever - carpets & building materials matter
- ▶ Single-use take-out food packaging has been essential during pandemic
- ▶ Soaps & hygiene products flew off shelves
- ▶ How do we recover from pandemic while building a more sustainable future?





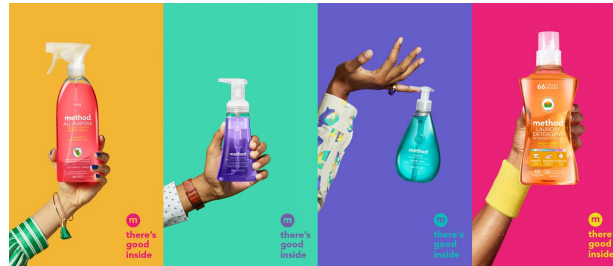
# Challenge Partners



**California Department  
of Toxic Substances  
Control (DTSC)**

Simona Balan

Aftermarket Carpet  
Treatments & Carpet  
Recycling

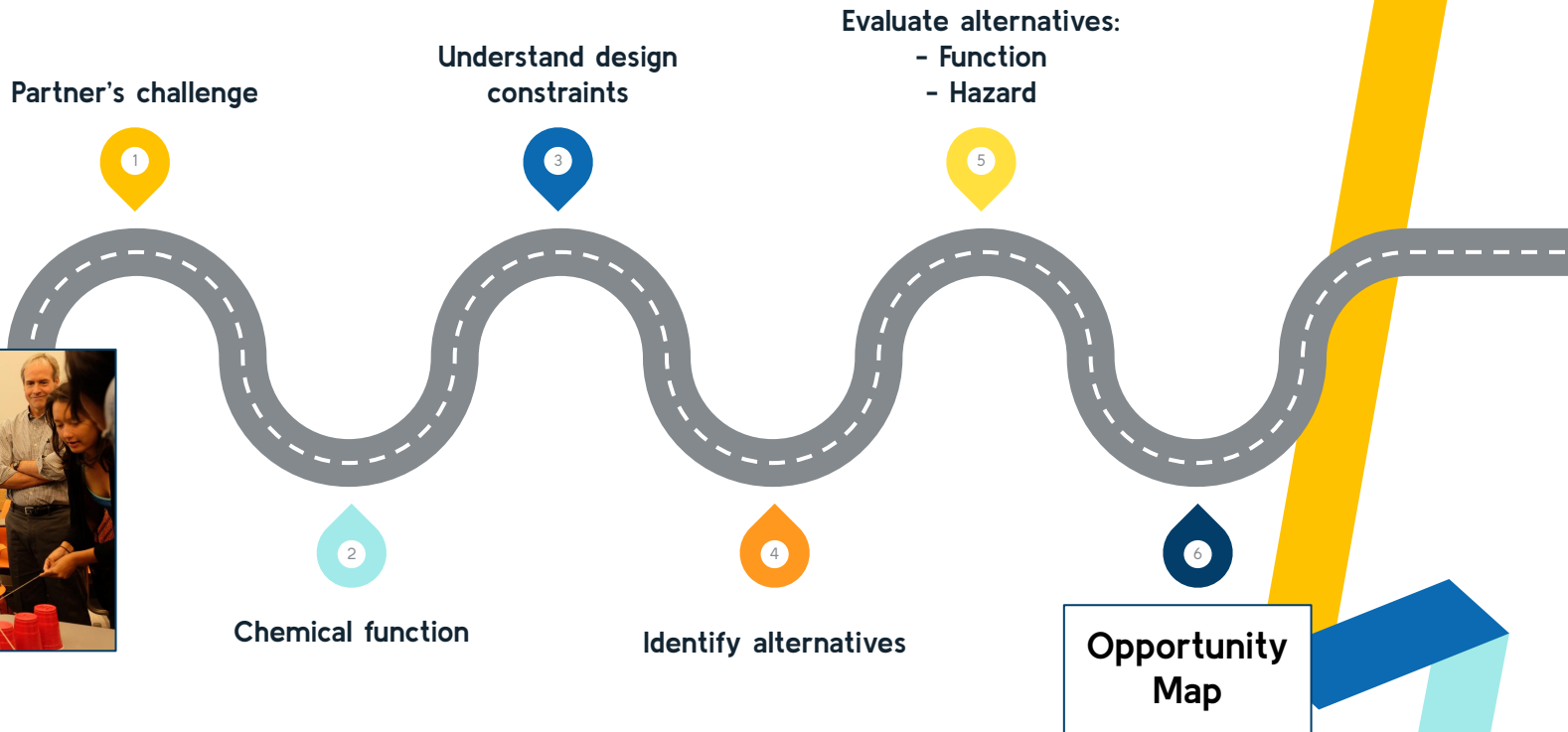


**Method**

Kaj Johnson

Product Packaging &  
Food Packaging

# Greener Solutions Course





**3** GOOD HEALTH AND WELL-BEING



**4** QUALITY EDUCATION



**8** DECENT WORK AND ECONOMIC GROWTH



**9** INDUSTRY, INNOVATION AND INFRASTRUCTURE



**10** REDUCED INEQUALITIES



**6** CLEAN WATER



**15** LIFE ON LAND



**16** PEACE, JUSTICE AND STRONG INSTITUTIONS

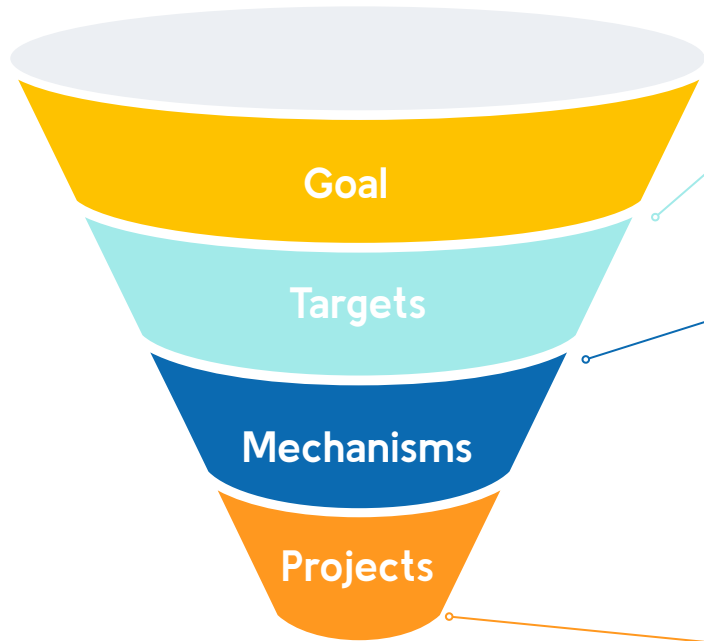


**17** PARTNERSHIPS FOR GOAL ACHIEVEMENT



Green chemistry can make clear contributions to achieving the Sustainable Development Goals (SDGs)

# Greener solutions to reach SDGs



Goal

Goal 12. Ensure sustainable consumption and production patterns

Targets

Target 12.4: Achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimise their adverse impacts on human health and the environment.

Mechanisms

The food packaging team identified alternatives such as nanocellulose and lignin sourced from within the paper system -- allowing replacement of a purchased feedstock by a waste product.

Projects

Carpet recycling team aids recycling without persistent chemicals -- less use of landfills, especially hazardous waste landfills.

Aftermarket carpet treatment and product packaging teams identified biopolymers, such as chitosan -- reduced use of petroleum products.

Circular Economy

Green Chemistry



Sustainable Development Goals