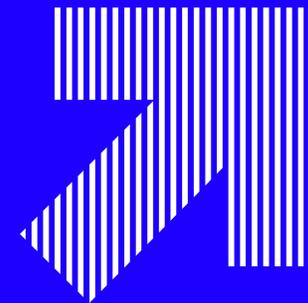




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AREA SERVIZI
PER LA RICERCA

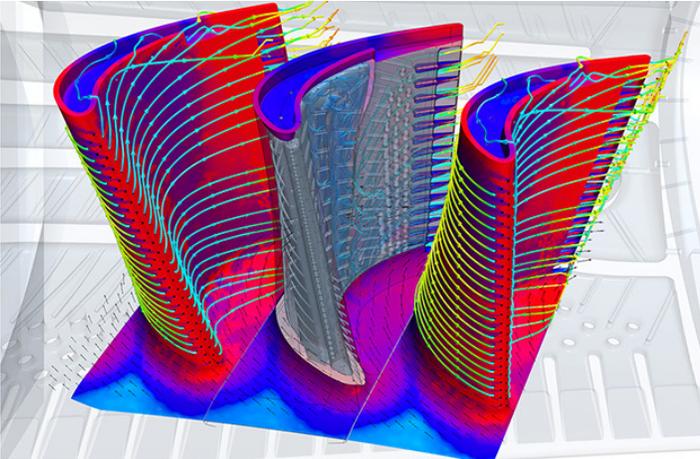


DOTTORATO IN SCIENZE DELL'INGEGNERIA ENERGETICA E AMBIENTALE





Heat and Fluid Flow



Materials and Chemical Processing

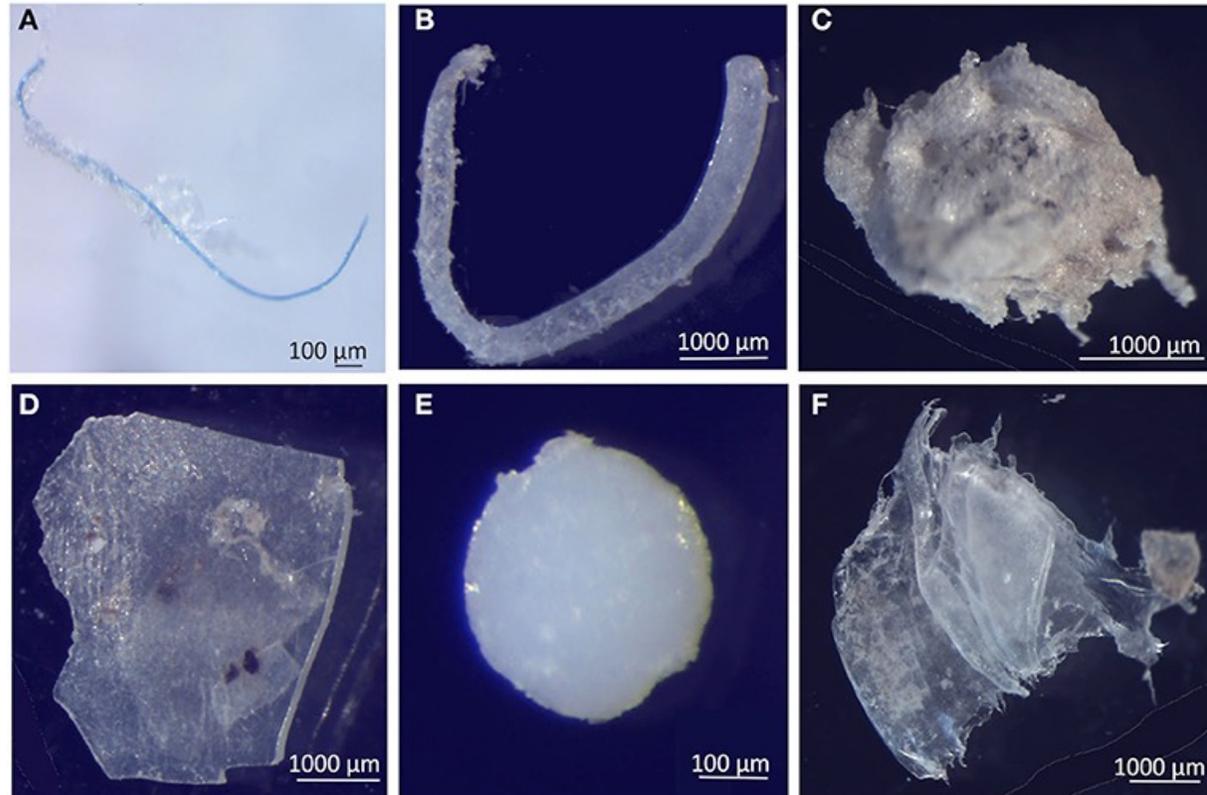


Energy Management and Energy Optimization



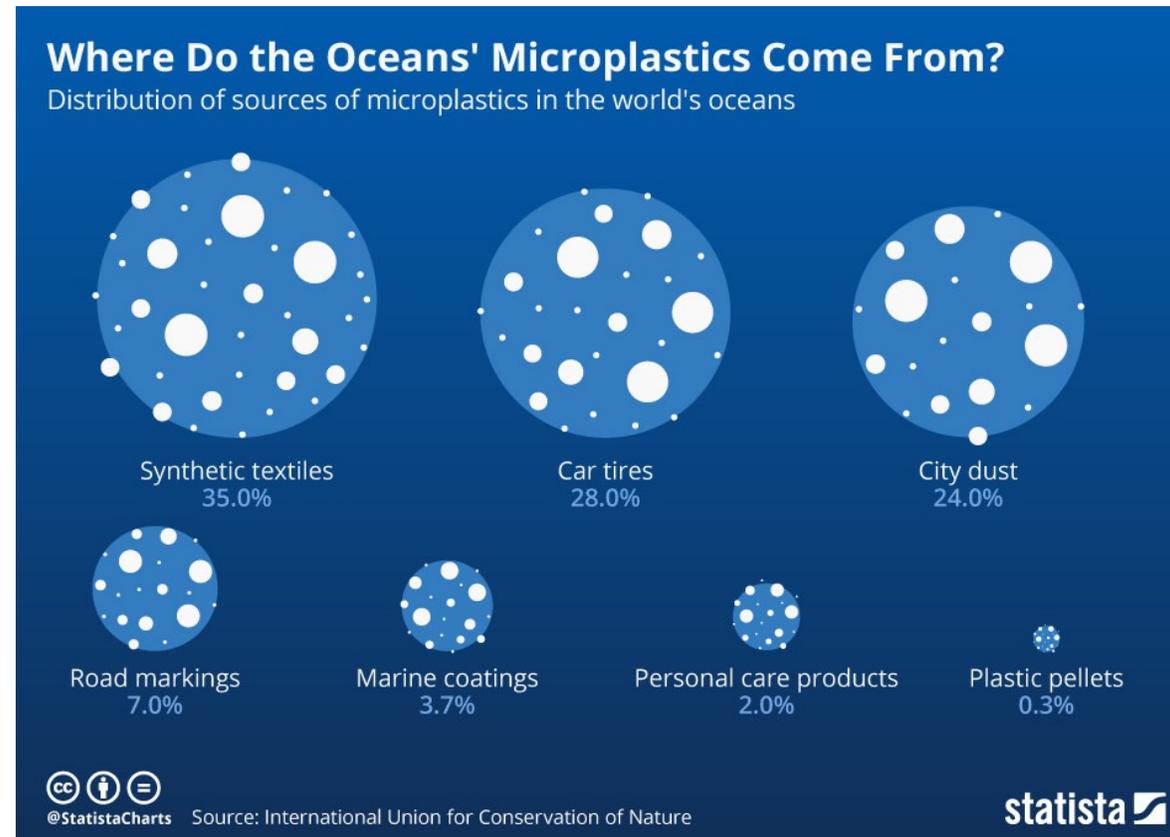


Area Heat and Fluid Flow: Inquinamento da microplastiche



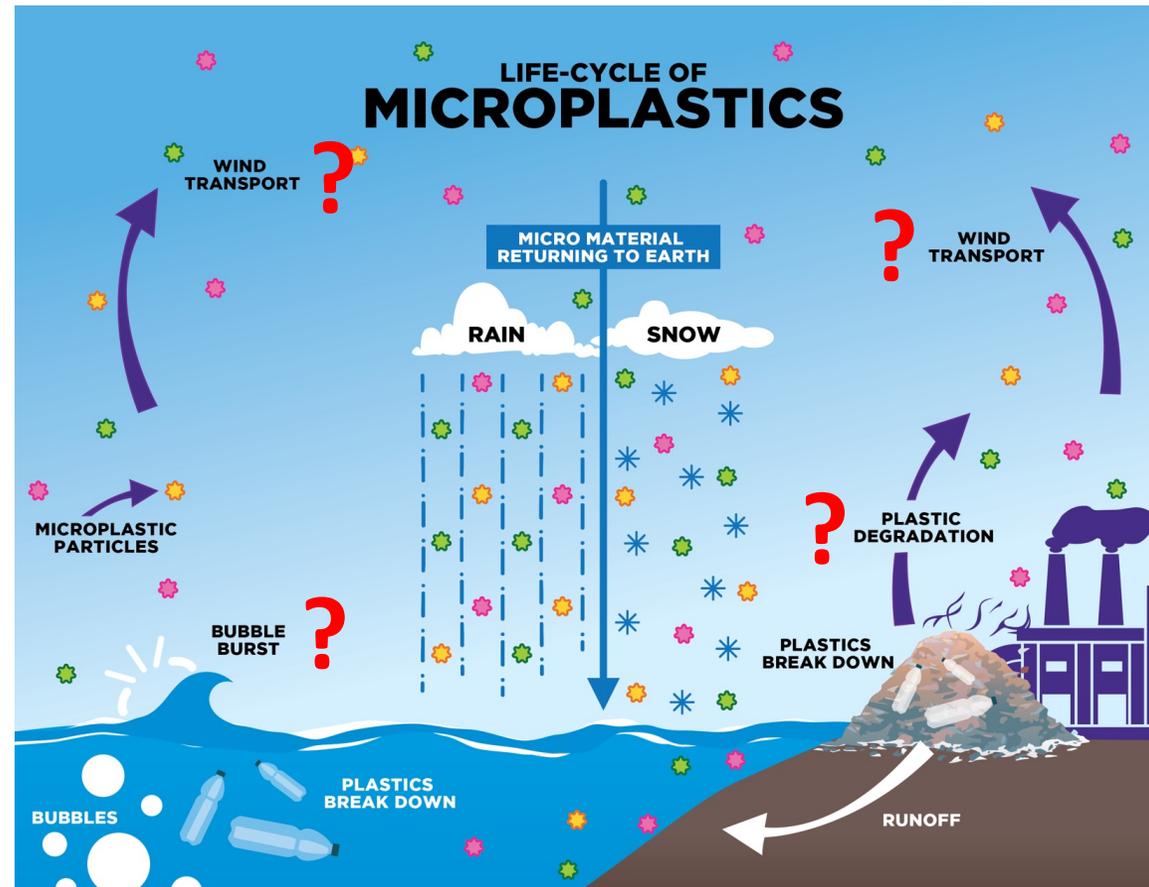


Area Heat and Fluid Flow: Inquinamento da microplastiche





Area Heat and Fluid Flow: Inquinamento da microplastiche





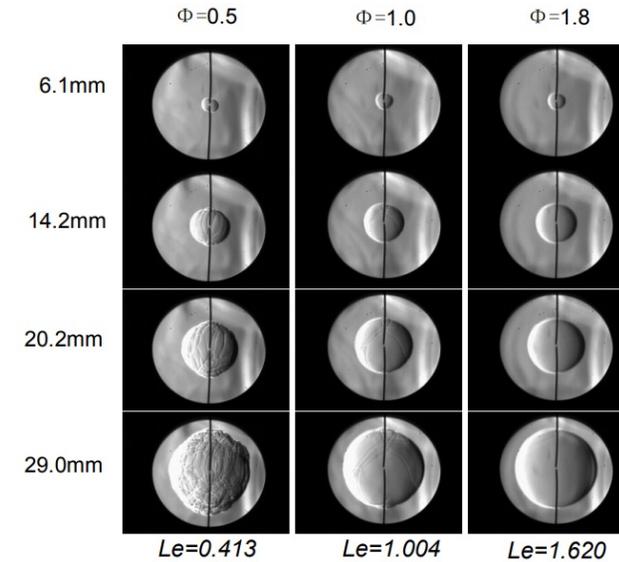
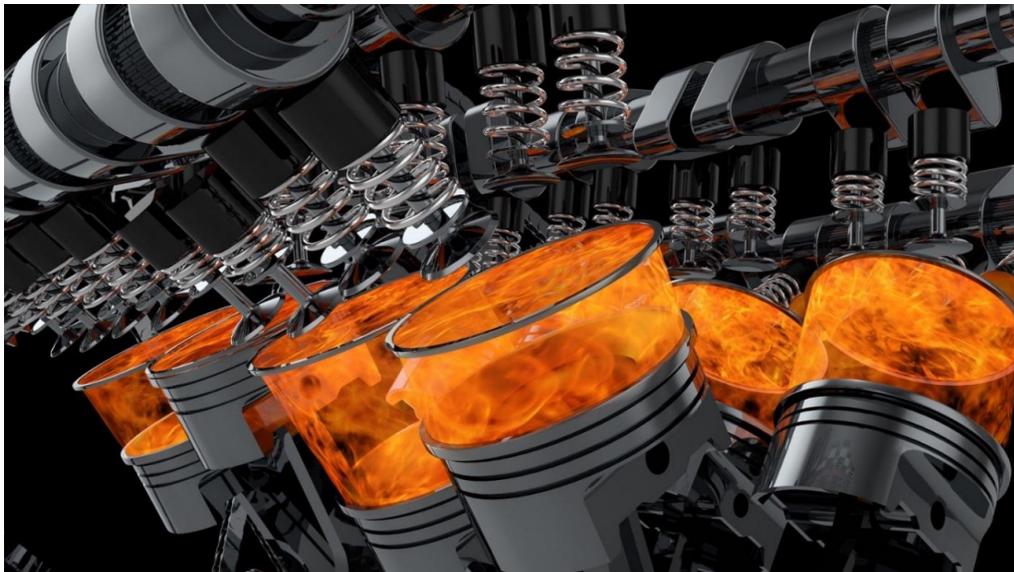
Area Heat and Fluid Flow: Motori a Combustione Interna

Modellazione della combustione nei **motori a iniezione**:

- Iniezione ed evoluzione della fiamma
- Combustione turbolenta

Motori a combustione interna innovativi:

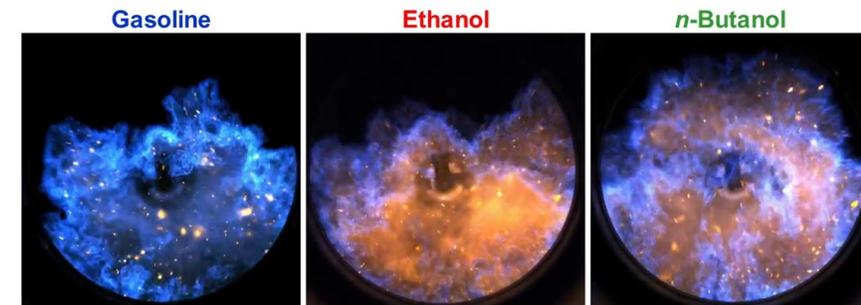
- HCCI (Homogeneous-Charge Compression Ignition)
- RCCI (Reactivity-Controlled Compression Ignition)



Combustion instabilities in H_2 /air flames

Spark-Ignition Engine Combustion
Different Fuels

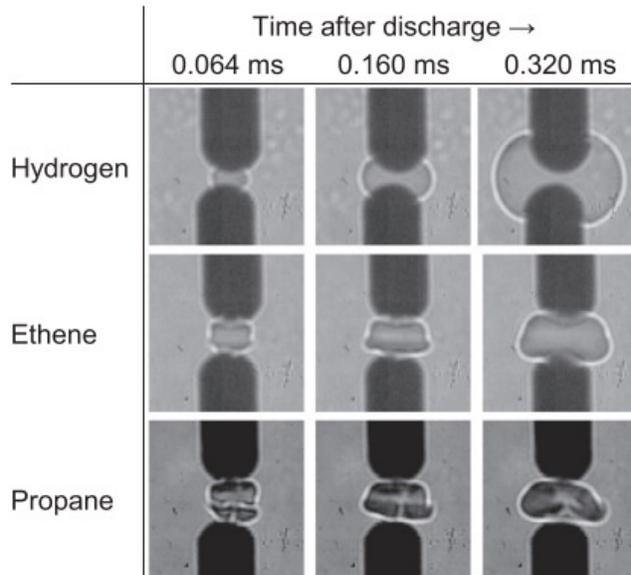
Imperial College
London



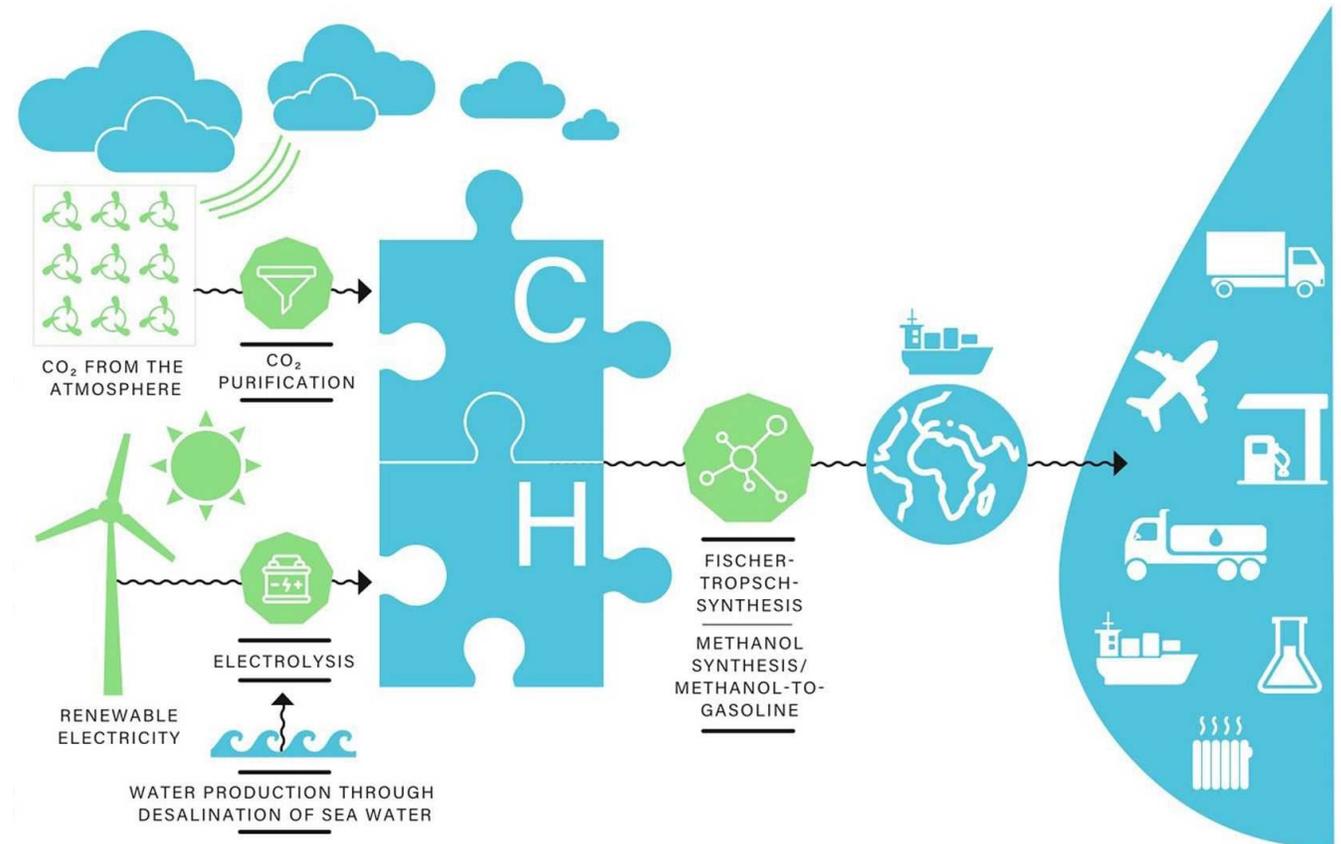


Area Heat and Fluid Flow: Combustibili Alternativi (E-Fuel)

- Basic fuels: **hydrogen**, methane, propane
- Fuel blends: gasoline, diesel fuel, TRFs
- **Alcohols**: ethanol, methanol, butanol
- **Biofuels, e-fuels**



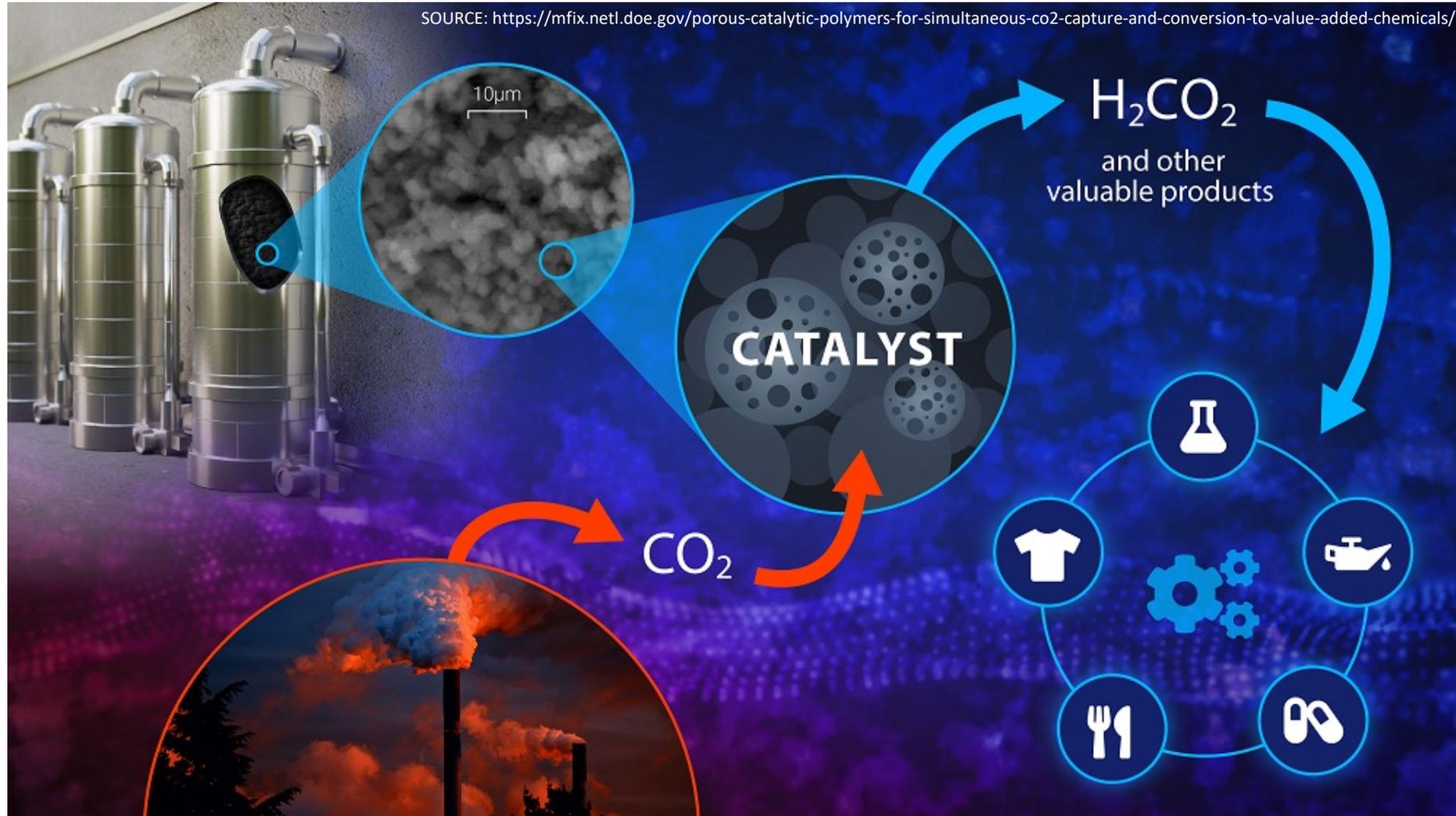
Flame kernel development near minimum ignition energy



e-fuel production

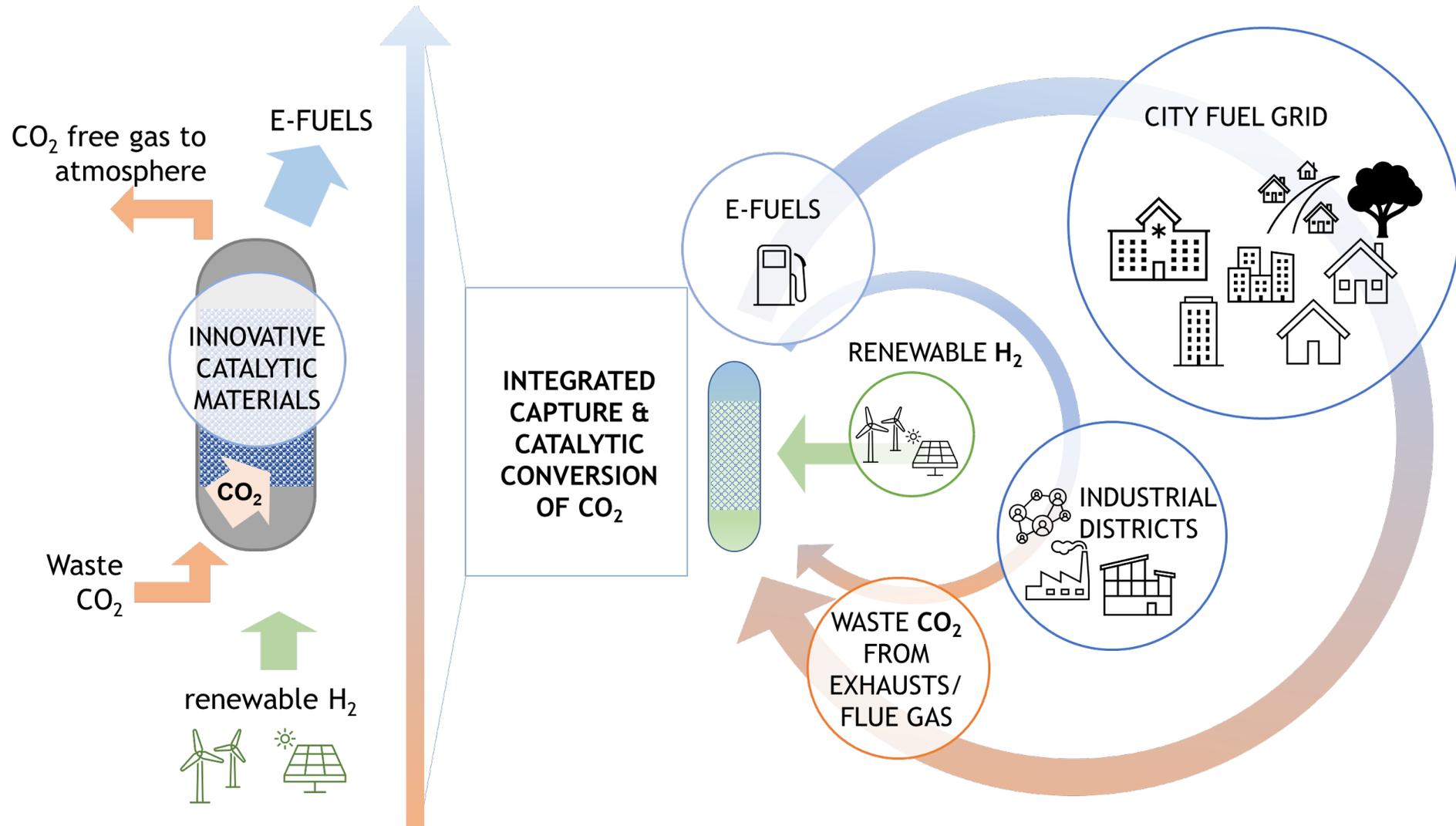


Area Materials and Chemical Processing: Conversione catalitica della CO₂



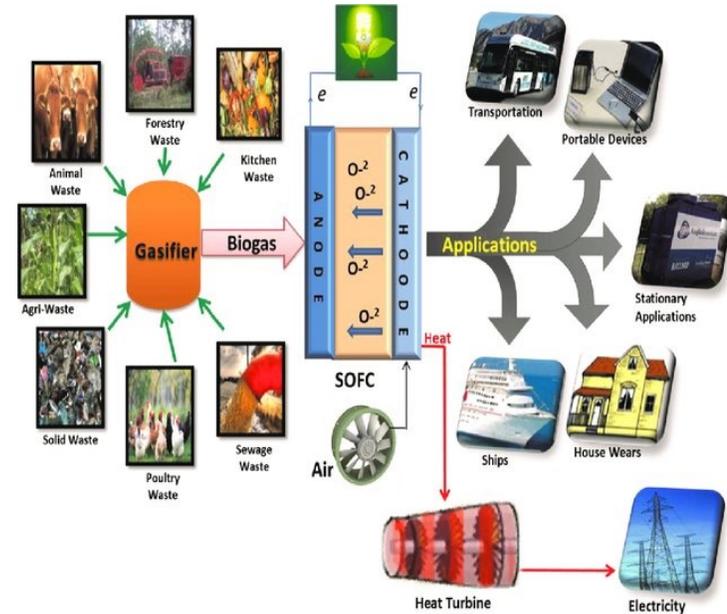
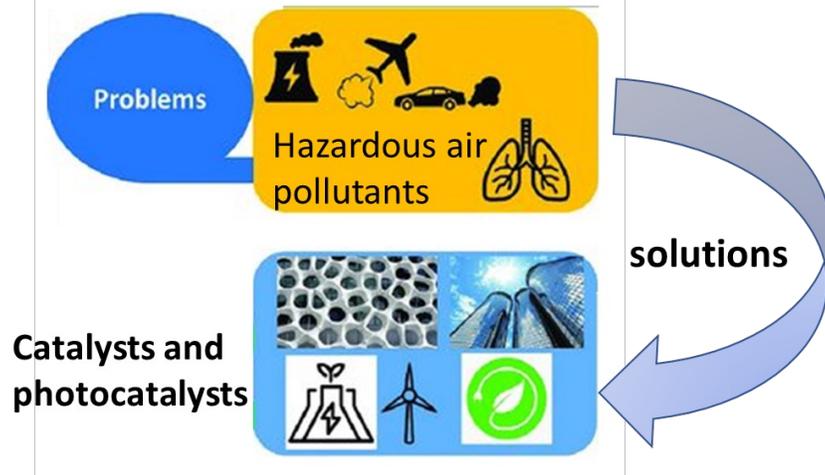


Area Materials and Chemical Processing: Conversione catalitica della CO₂

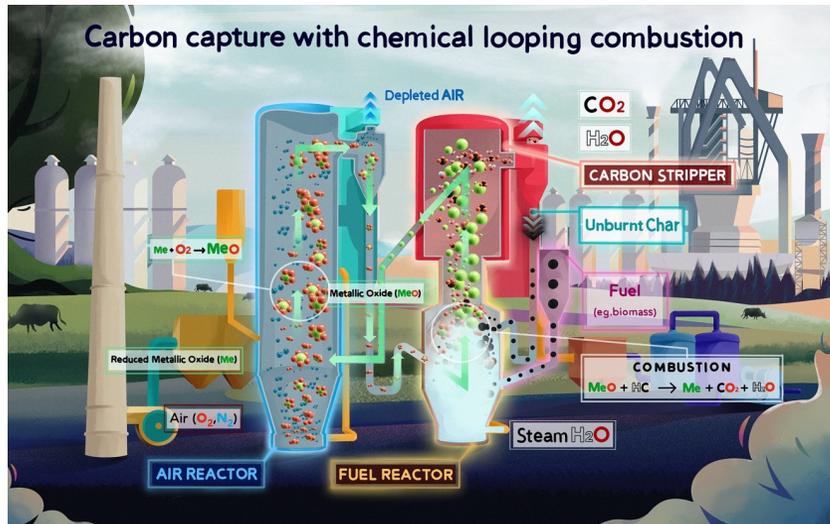
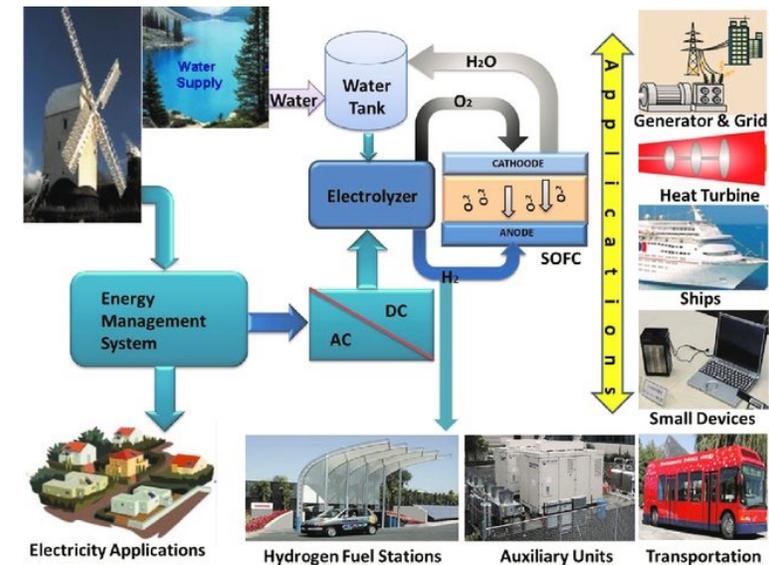




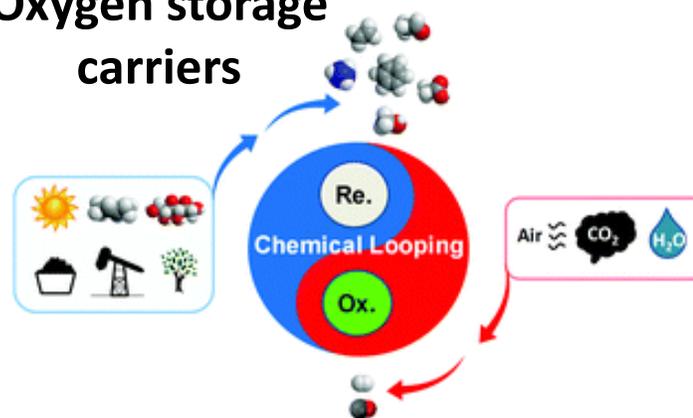
Area Materials and Chemical Processing: Catalisi e Transizione Verde



Electrocatalysts and Materials for Fuel Cells and Electrolysers for energy value chains



Oxygen storage carriers





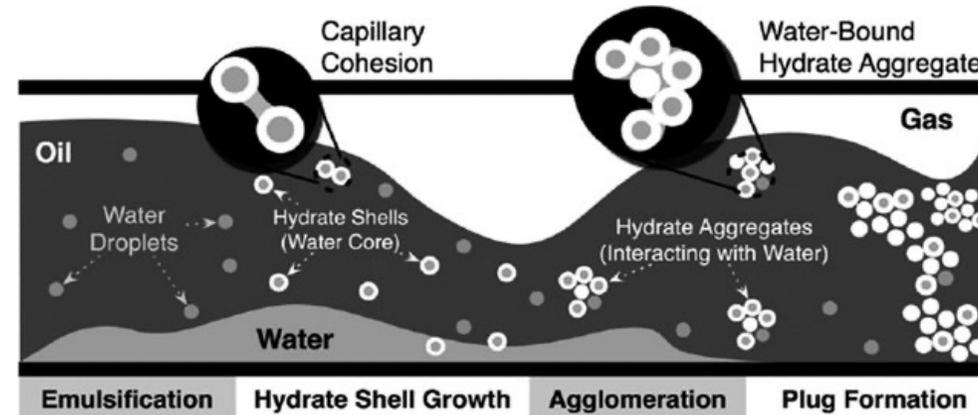
Area Materials and Chemical Processing: Oleodotti

Problemi principali:

- Deposizione di cere di paraffina e gas idrati



Kirkuk-Ceyhan pipeline

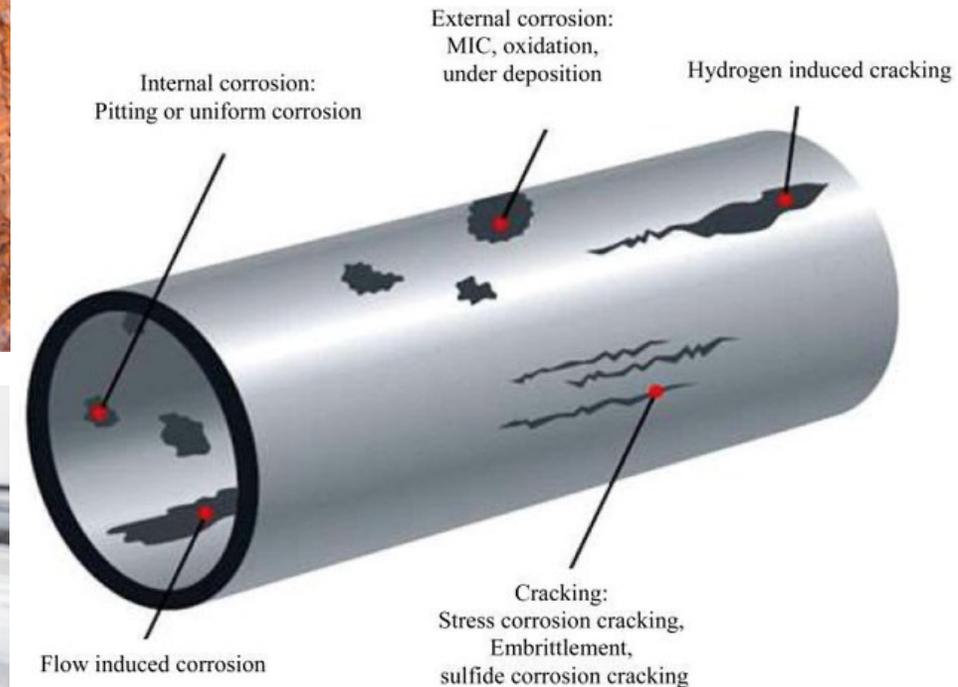




Area Materials and Chemical Processing: Oleodotti

Problemi principali:

- Corrosione





Area Materials and Chemical Processing: Stiction in sistemi frenanti di autoveicoli

Sistema frenante di un autoveicolo

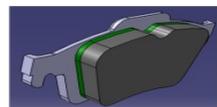
Disco freno



Pastiglia freno



Materiale di attrito



MoS₂,
Graphite,
...



Solid
Lubricants
5-15% vol.

Fillers and
Abrasives
40-60% vol.



Al₂O₃,
ZrO₂,
Chromite,
Barite,
Vermiculite,
...

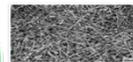


Phenolic
Resins

Organic Binder
10-20% vol.



Fibers and
Rubber
5-20% vol.

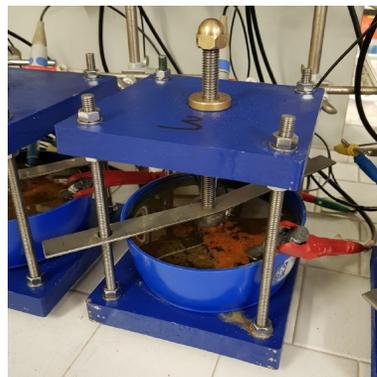


Metal fiber
Aramide
Glass fiber
...

Stiction: fenomeno di adesione del materiale di attrito (pastiglia freno) dovuto a corrosione del disco freno in ghisa lamellare (in condizioni statiche)



Studio del fenomeno dello stiction: meccanismo di adesione

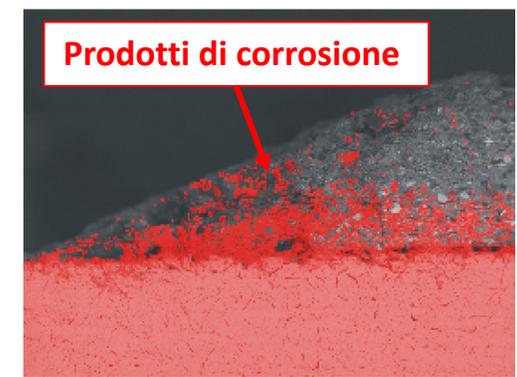


Materiale di attrito



Disco freno (sezione)

Prodotti di corrosione



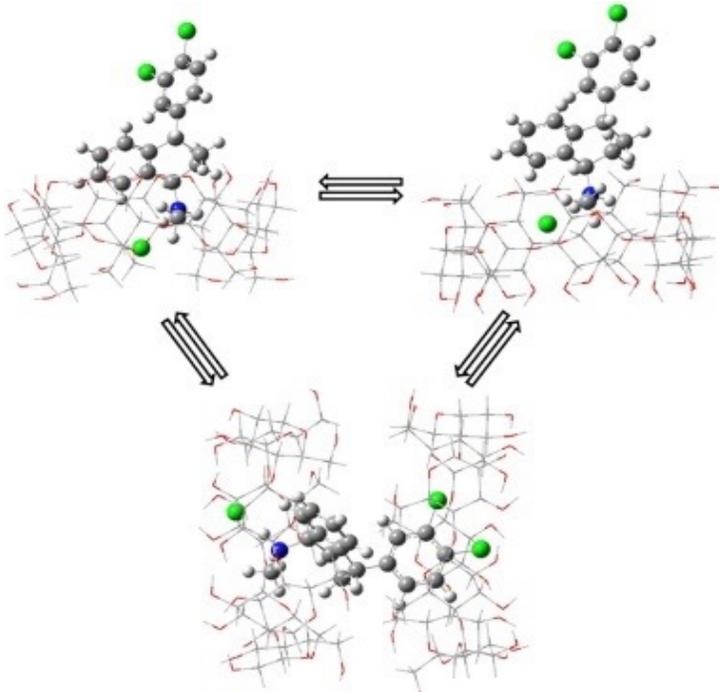
1mm



Area Materials and Chemical Processing: Rimozione e Trasporto di Farmaci

Farmaci nell'ambiente = inquinanti

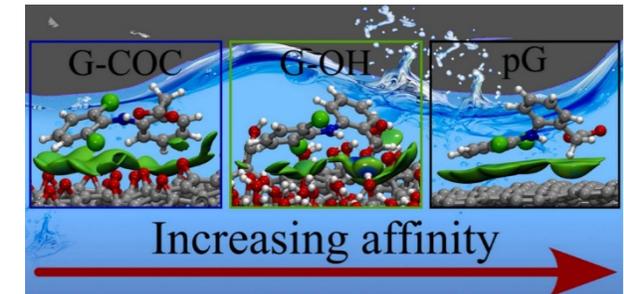
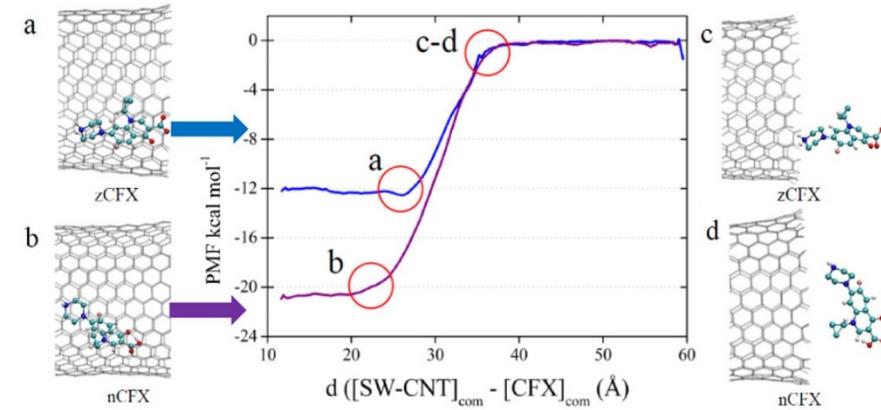
Materiali per il trasporto



Simulazioni dell'interazione tra farmaci e materiali per il loro trasporto nelle formulazioni (**drug delivery**) e la loro rimozione dall'ambiente (**drug removal**)



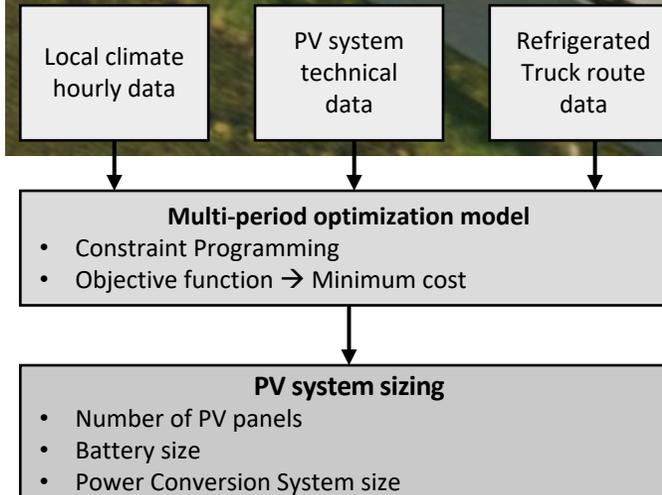
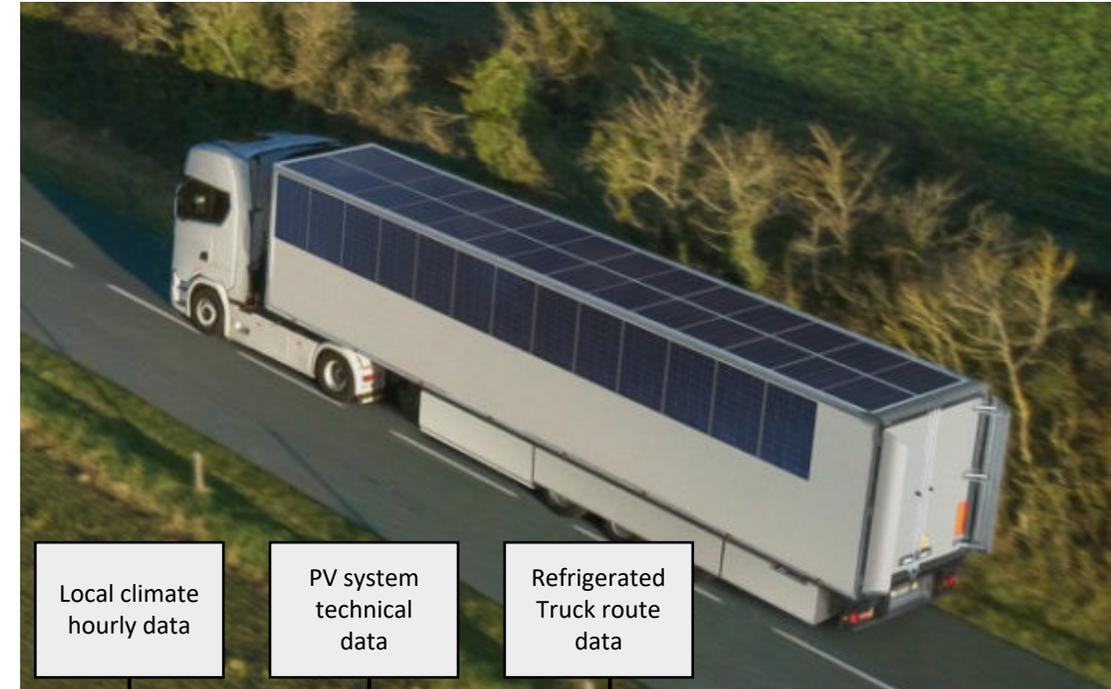
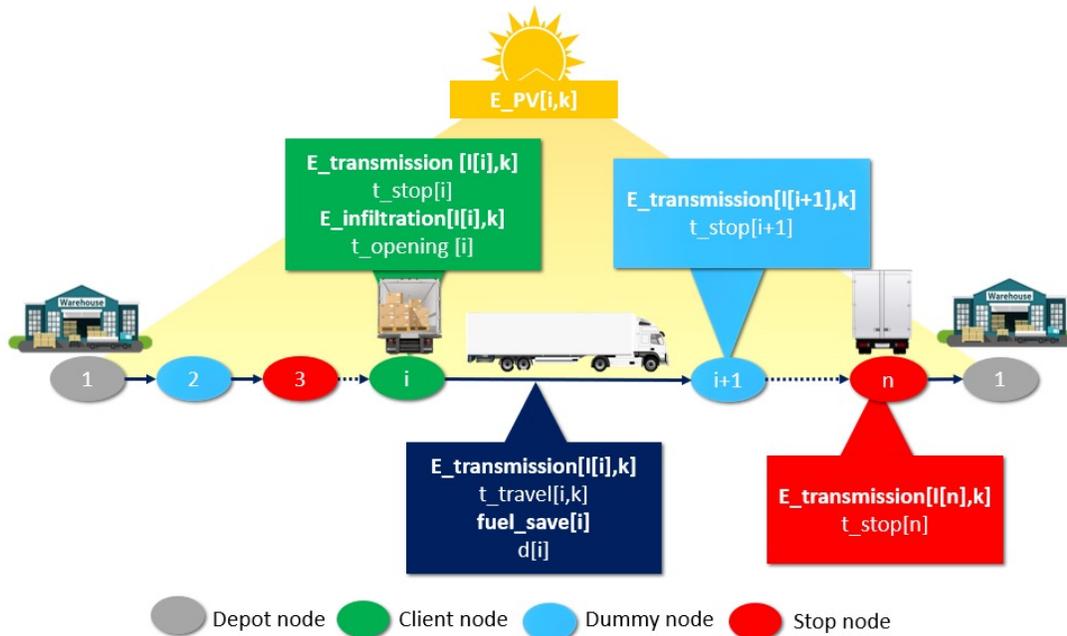
Materiali per la Rimozione





Area Energy Management and Optimization: Logistica Sostenibile

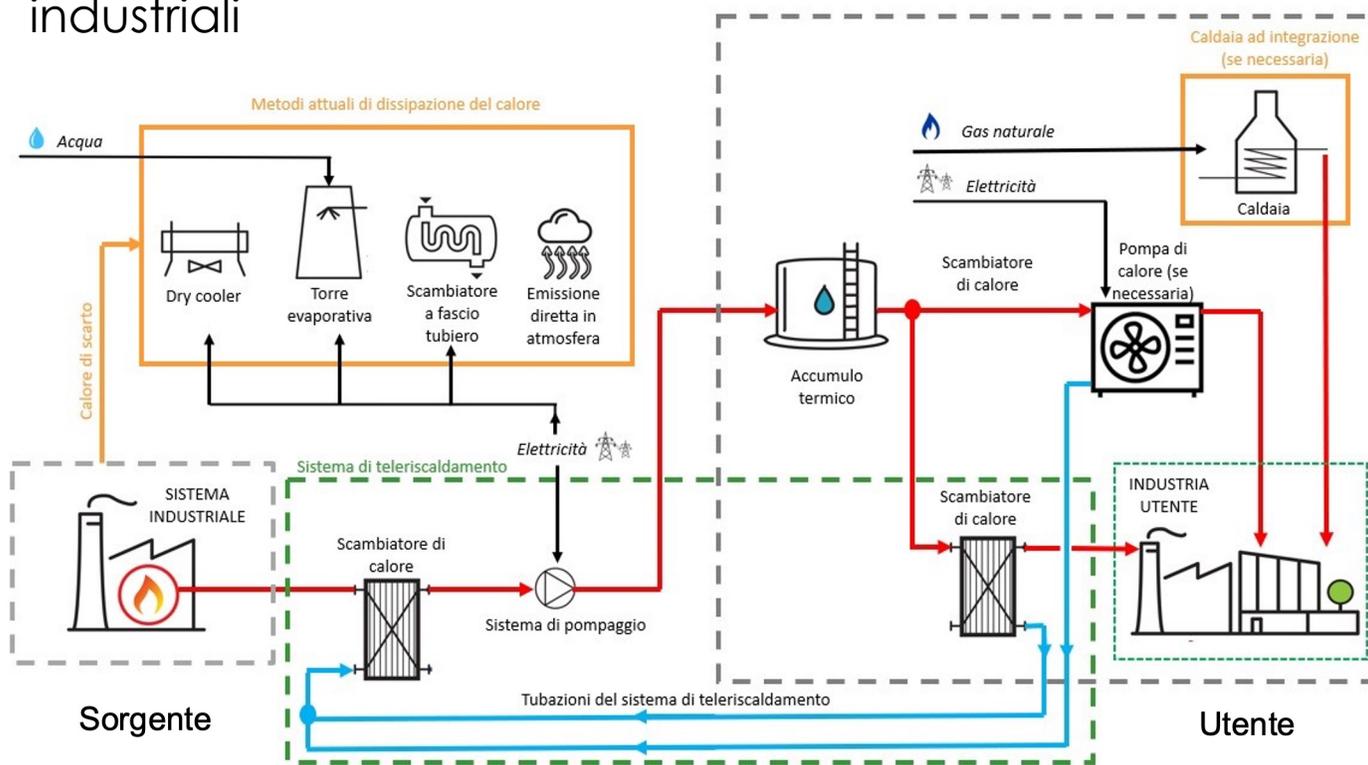
Integrazione di energia fotovoltaica nei trasporti refrigerati





Area Energy Management and Optimization: Simbiosi energetiche industriali

Condivisione di flussi energetici negli ecosistemi industriali



Obiettivi:

Far nascere nuove comunità energetiche in ambito industriale



Problemi principali:

- Previsione e matching curve di carico: demand and supply management
- Sistemi di accumulo (termico, batterie, idrogeno...)
- Calcolo della carbon footprint e della water footprint prima e dopo l'intervento



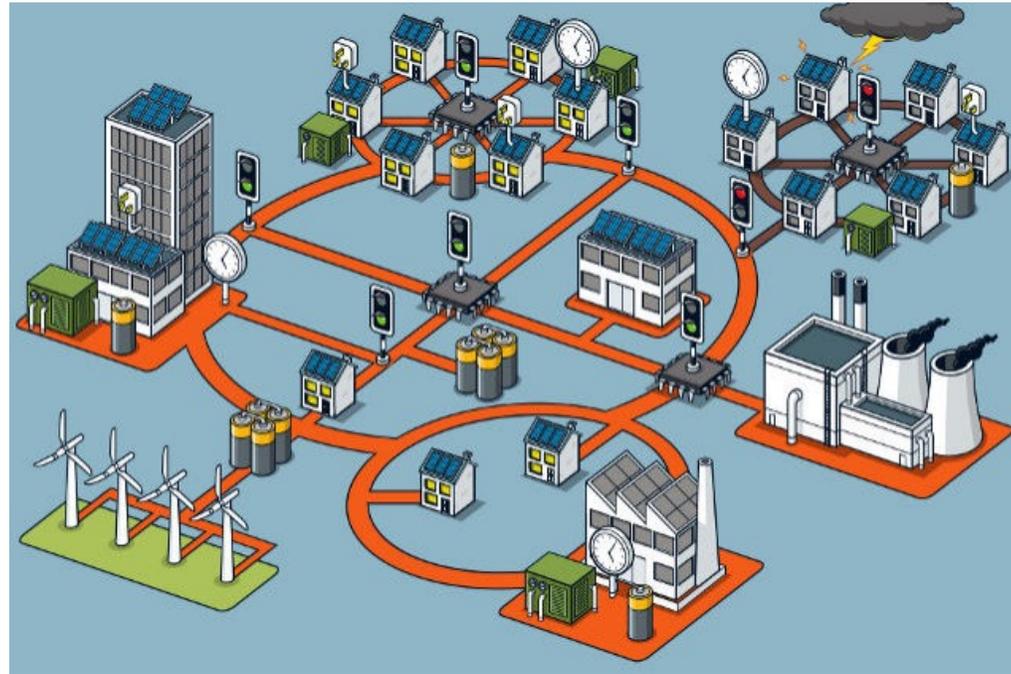
Esempi: Roncadin SpA



Area Energy Management and Optimization: Comunità energetiche



Sfruttamento
fonti rinnovabili
intermittenti



Monitoraggio e
simulazione degli edifici e
degli impianti



Gestione delle
domande e
produzioni di energia

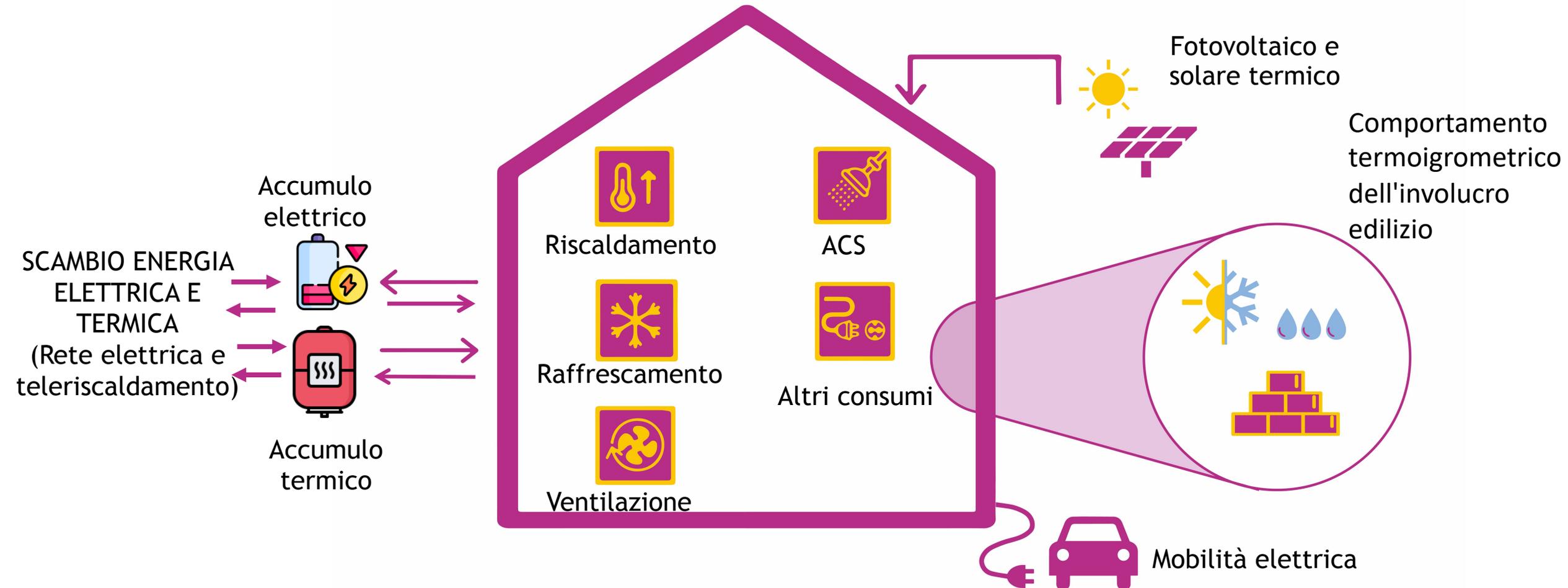
Comunità energetica: insieme di persone o enti che condividono l'energia prodotta localmente riducendo la dipendenza dalla rete nazionale. L'obiettivo è massimizzare l'autoconsumo riducendo l'impatto ambientale.



Aumento
flessibilità e
riduzione della
domanda



Area Energy Management and Optimization: New Zero Energy Building (NZEB)





Area Energy Management and Optimization: Refrigerazione con fluidi naturali

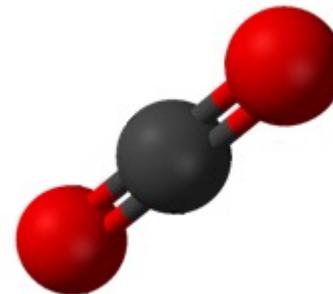
La refrigerazione è responsabile del 7.8% delle emissioni di gas serra, di cui il 37% è dovuto alle perdite dirette di refrigeranti tradizionali con alto impatto sull'effetto serra, che danno anche vita a sostanze dannose per ambiente e salute (PFAS)



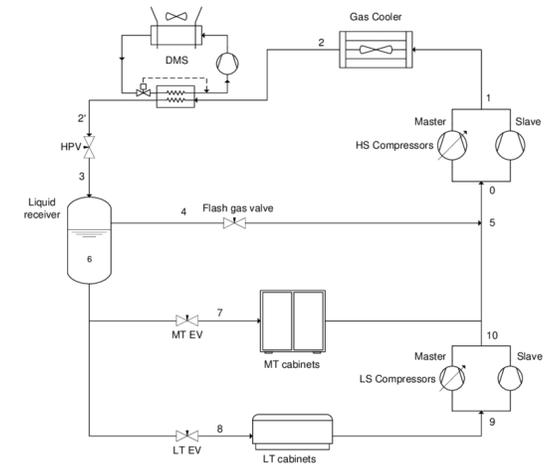
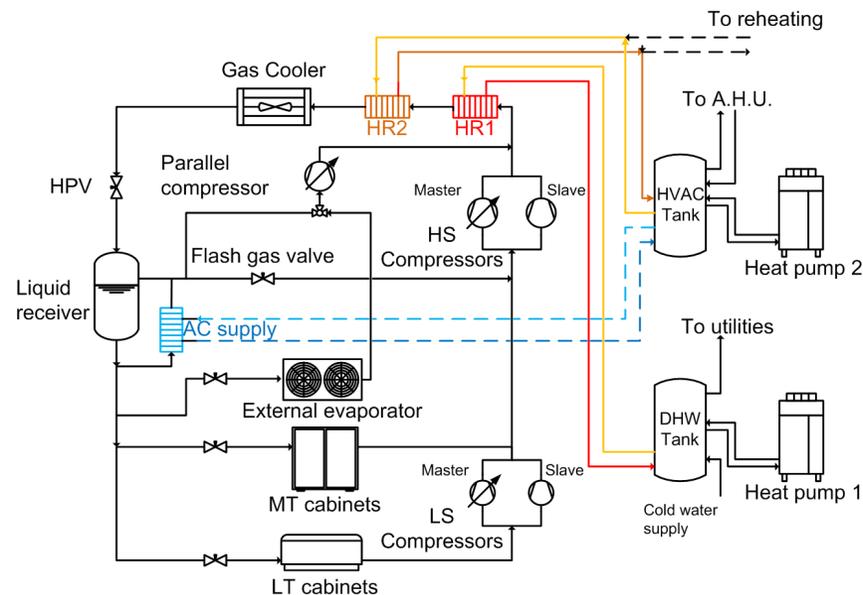
Sostituzione dei refrigeranti tradizionali con sostanze meno dannose:

FLUIDI NATURALI (es. CO₂)
migliorare le prestazioni energetiche

Logiche di recupero termico e integrazione con impianto HVAC

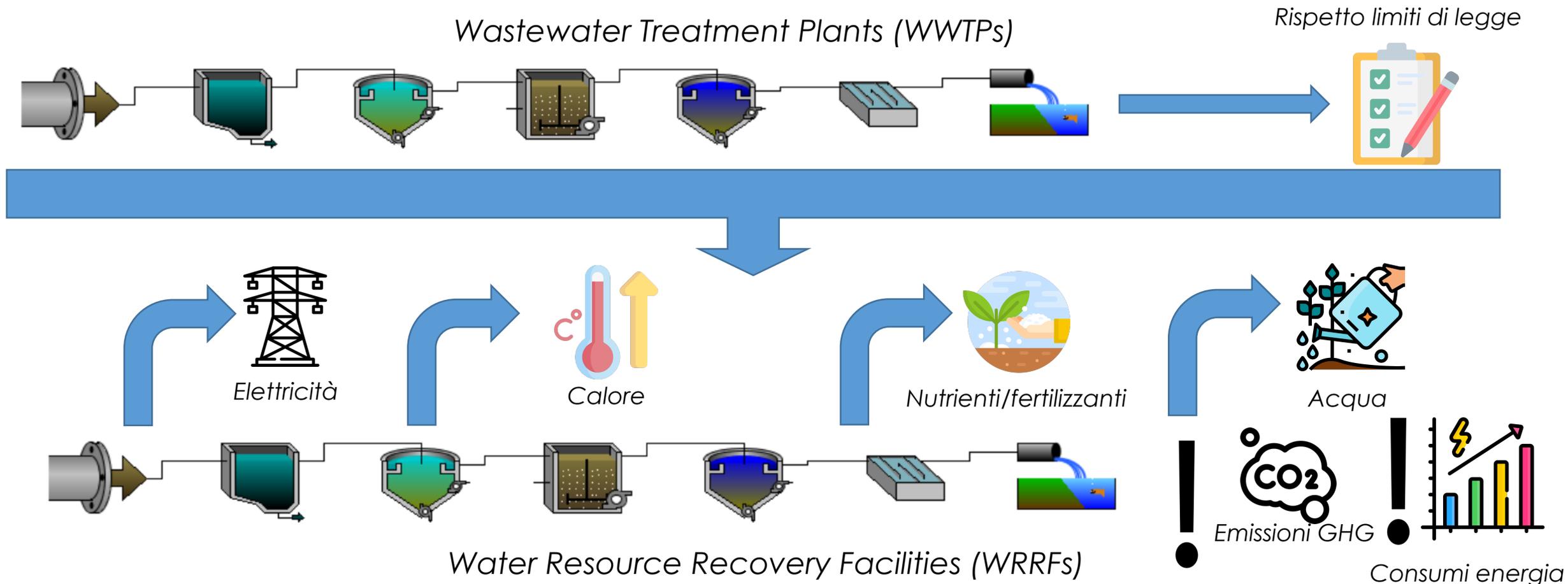


Utilizzo di schemi di impianto innovativi





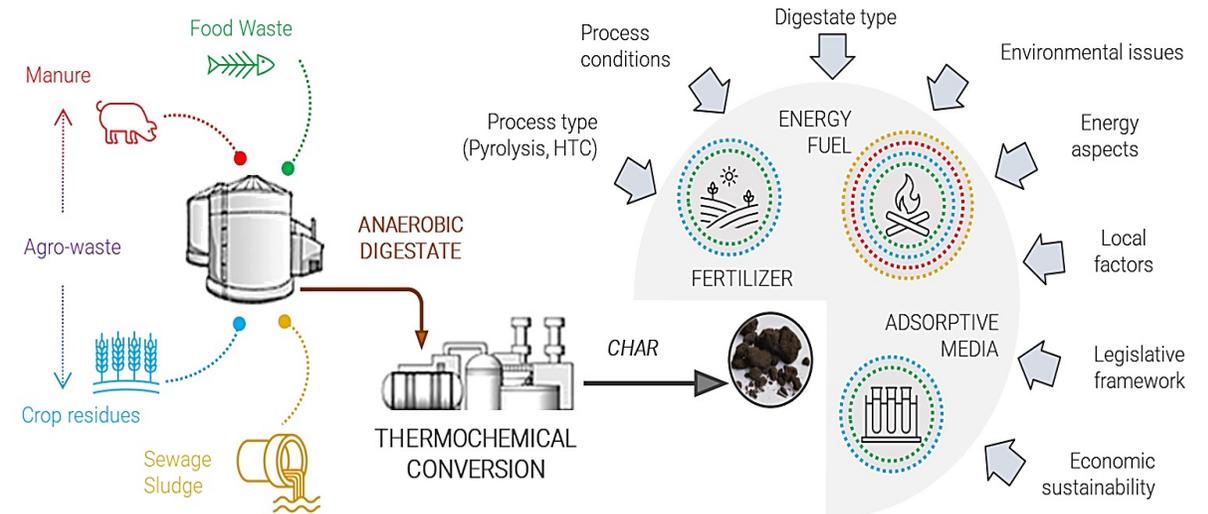
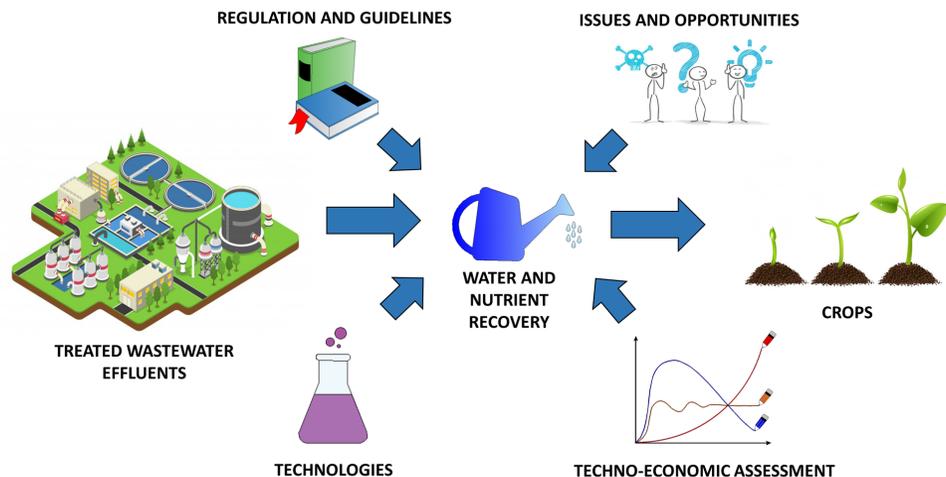
Area Energy Management and Optimization: Tecnologie Ambientali - Recupero di materia ed energia dal CII e dai rifiuti





Area Energy Management and Optimization: Tecnologie Ambientali - Recupero di materia ed energia dal CII e dai rifiuti

Riutilizzo delle acque depurate
in agricoltura (chiusura del ciclo)



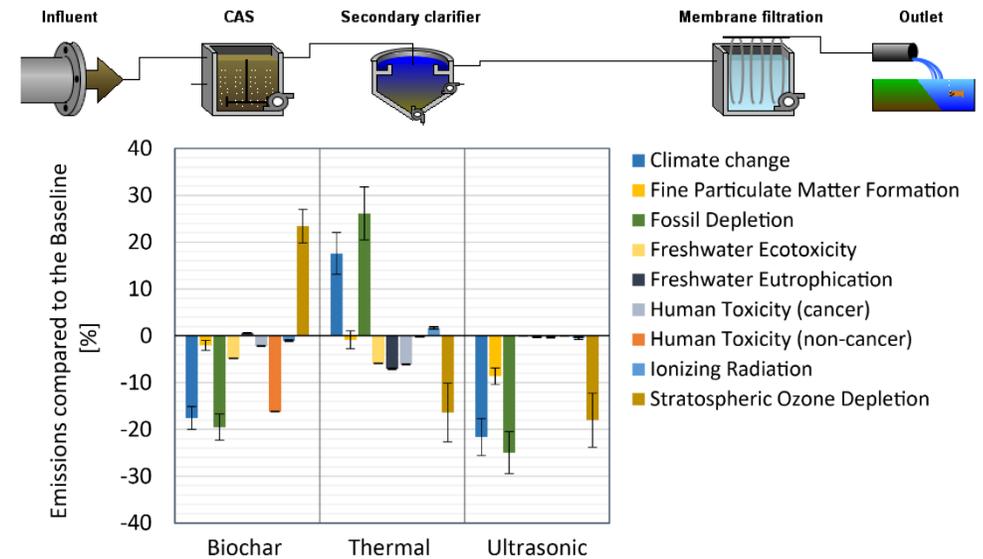
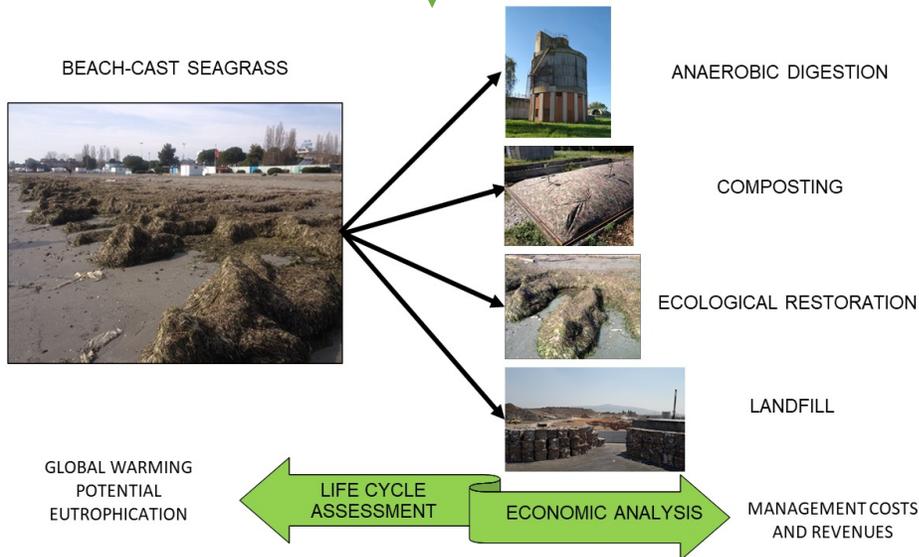
Trattamenti innovativi per
recupero materia ed energia dai
fanghi di depurazione



Area Tecnologie Ambientali - Energy Management and Optimization:

Recupero di materia ed energia dal CII e dai rifiuti

Valorizzazione di scarti organici presenti sul territorio



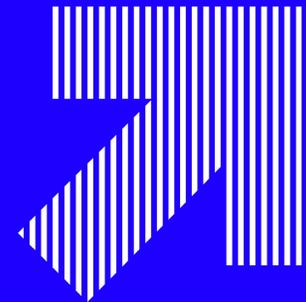
Applicazione di Life Cycle Assessment e modellistica di processo



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Grazie

Contatti:

Cristian Marchioli - marchioli@uniud.it