2D4D

Disruptive Digitalization For Decarbonization

Elena Verdolini, PhD.

Università degli Studi di Brescia
RFF-CMCC European Institute on Economics and the Environment,
Centro Euro-Mediterraneo sui Cambiamenti Climatici

FUTURA EXPO
4 ottobre 2022

FUTURA EXPO
ECONOMIA X L'AMBIENTE 2·3·4 OTTOBRE 2022

40 1982 | 2022 UNIVERSITÀ DEGLI STUDI DI BRESCIA

RFF CMCC European Institute on Economics and the Environment

European Research Council
Established by the European Commission

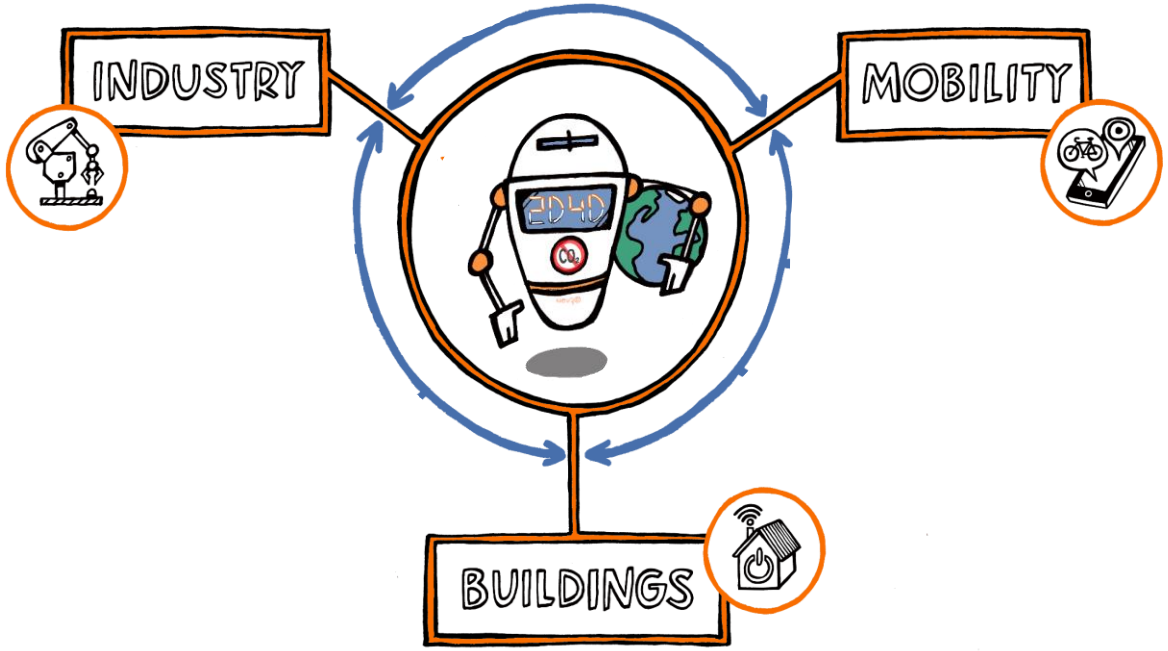
Tecnologie digitali

Emissioni

Disruptive Digitalization For Decarbonization

Impatti socio-economici

Transizione energetica



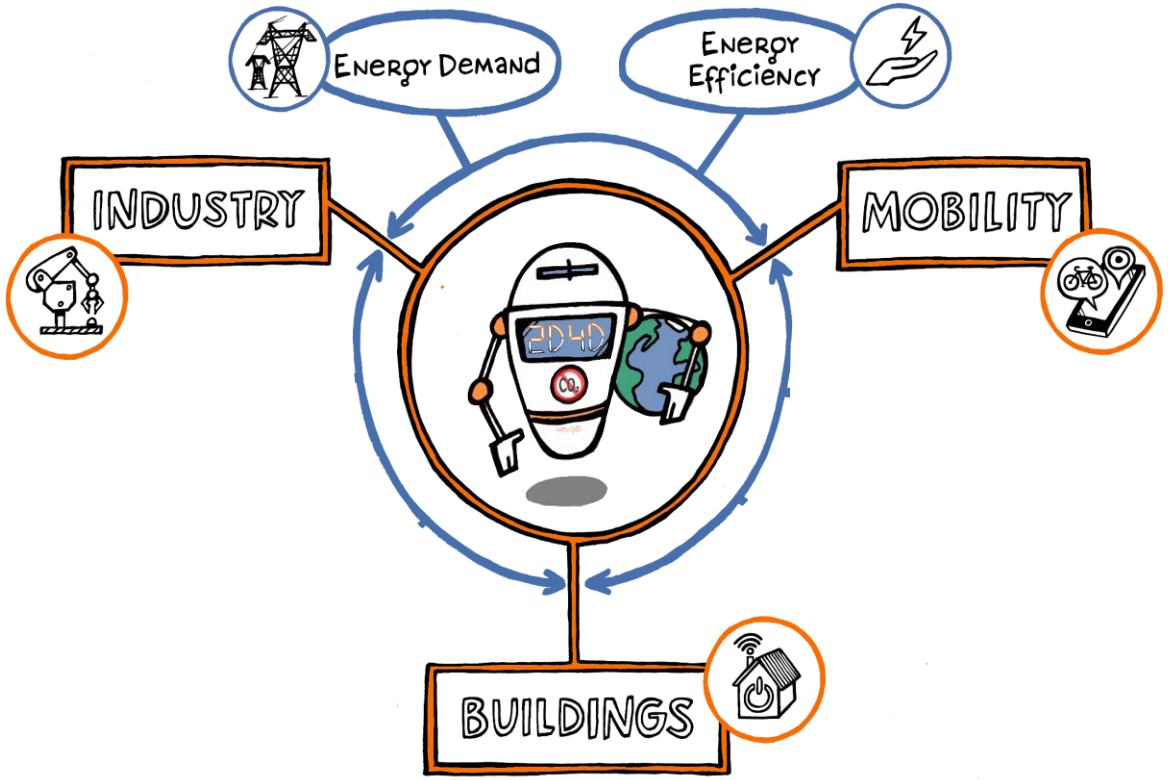
Tecnologie digitali

Emissioni

Disruptive Digitalization For Decarbonization

Impatti socio-economici

Transizione energetica



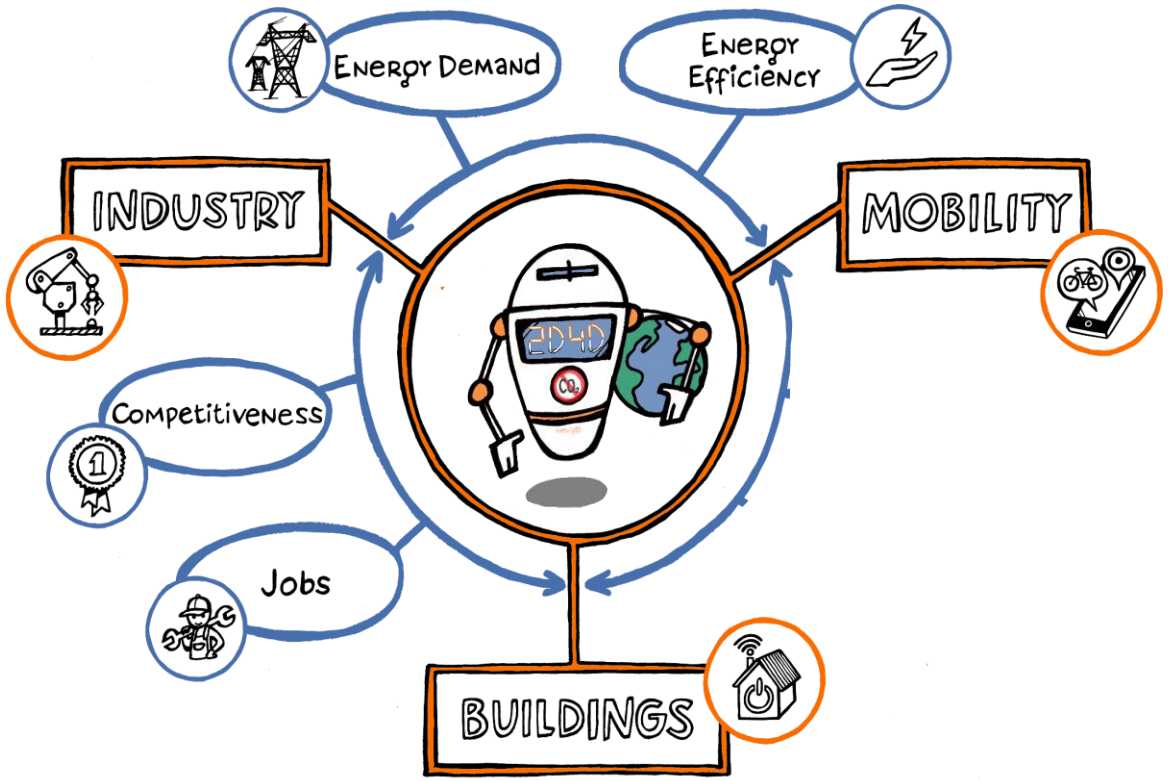
Tecnologie digitali

Emissioni

Impatti socio-economici

Disruptive Digitalization For Decarbonization

Transizione energetica



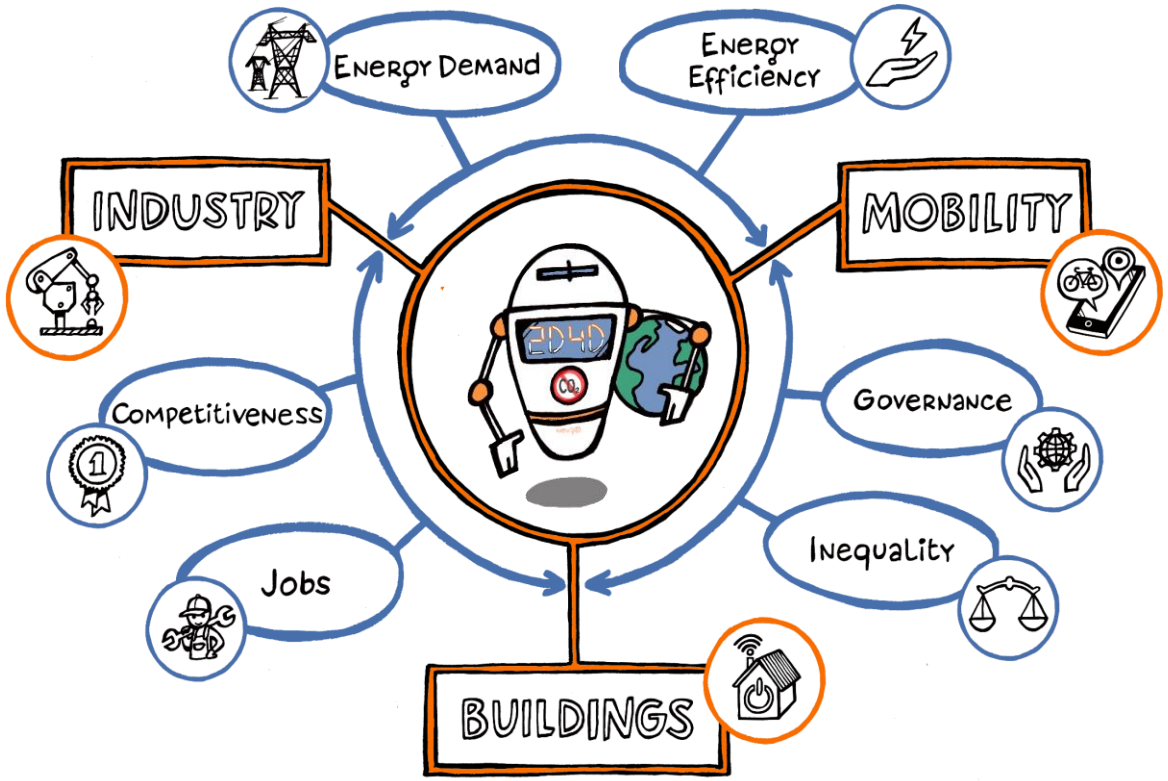
Tecnologie digitali

Emissioni

Disruptive Digitalization For Decarbonization

Impatti socio-economici

Transizione energetica



Tecnologie digitali

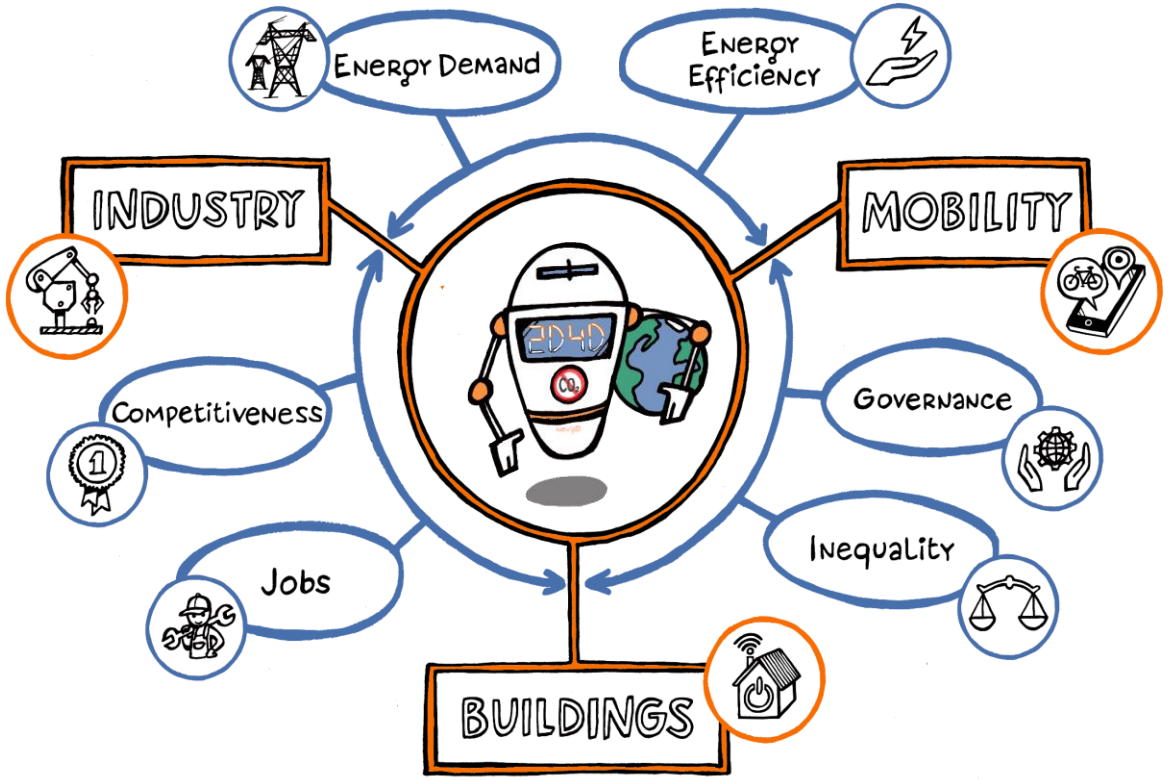
Emissioni

2D4D
Disruptive Digitalization For Decarbonization

Impatti socio-economici

Transizione energetica

C S
M T



FUTURA EXPO
ECONOMIA X L'AMBIENTE 2·3·4 OTTOBRE 2022

UNIVERSITÀ DEGLI STUDI DI BRESCIA

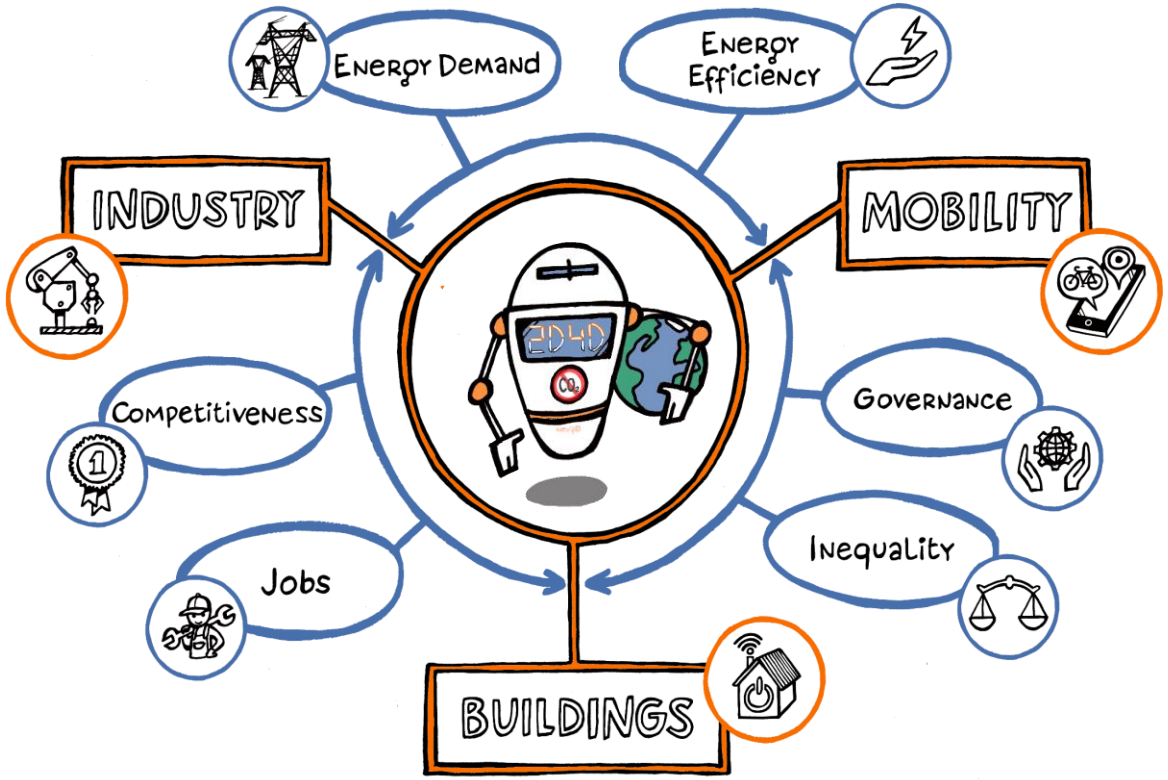
Tecnologie digitali

Emissioni

2D4D
Disruptive Digitalization For Decarbonization

Impatti socio-economici

Transizione energetica



Legislazione e policy

Domanda di competenze nella forza lavoro

Impatto di innovazioni su competitività

FUTURA EXPO
ECONOMIA X L'AMBIENTE 2·3·4 OTTOBRE 2022

UNIVERSITÀ DEGLI STUDI DI BRESCIA

Tecnologie digitali

Emissioni

Disruptive Digitalization For Decarbonization

Impatti socio-economici

Transizione energetica

Normativa per il riciclo batterie al litio

Legislazione e policy

Tassonomia di tecnologie digitali ad alto potenziale di mitigazione nel settore industriale e analisi del loro impatto su competenze richieste dall'impresa

Domanda di competenze nella forza lavoro

Casi studio e best practices

Impatto di innovazioni su competitività

Tecnologie digitali

Emissioni

Disruptive Digitalization For Decarbonization

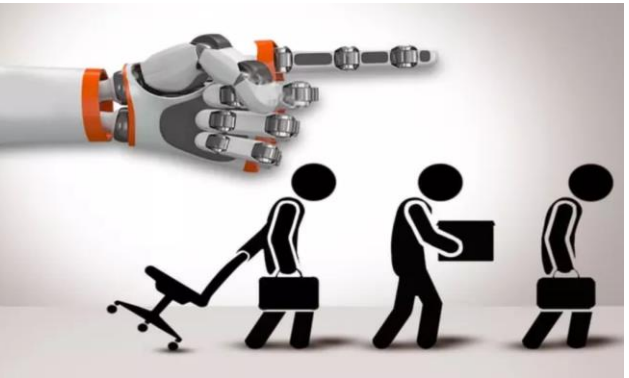
Impatti socio-economici

Transizione energetica

Effetto dislocamento, effetto produttività ed effetto reintegrazione

Evidenza scientifica esiste solo per robotizzazione. Impatti di altre tecnologie digitali non sono noti

Domanda di competenze nella forza lavoro



Tecnologie digitali

Emissioni

Disruptive Digitalization For Decarbonization

Impatti socio-economici

Transizione energetica

Technology	Labor market effects
Industrial Robots	**Negative** ⇓ (Acemoglu and Restrepo, 2020): Robots and humans compete. One robot/'000 workers reduces empl/pop ratio by 0.2 pp and wages by 0.42%; (Grigoli et al., 2020): Routinization reduces labour force participation among prime-age men and women **No effect** ⇏; ∠ (Graetz and Michaels, 2018): 0.36 pp annual labor productivity growth (higher TFP, lower output price); No implications for aggregate hours worked; Reduction of hours worked for low skill (relative to middle and high) **Positive** ⇑; ∠ (Koch et al., 2021): Net job creation (10% rate). Note: gains for all worker types, including low-skilled and manufacturing. However, negative effects on non-adopting firms (empl., output, survival) **Δ skills** (Dauth et al., 2021): Job reduction in manufacturing (new entrants) but offset by new jobs in services. Incumbents have more stable employment and change tasks (higher quality jobs). Beneficial for complementary high skill occupations (managers, technicians). Young workers adapt education (less vocational training vs university and college).
Additive Manufacturing	**Positive, non causal** + (Felice et al., 2021): AM adoption and employment are positively associated at the industry level; Heterogeneous mechanisms across industries **Δ skills, non causal** (construction sector) (Hossain et al., 2020): AM would imply changes in the skill composition, from manual construction work to 3D programming and designing skills (Highlights from literature review) + Complement to labour productivity; higher workers' safety
Industrial Internet of Things (IIoT)	∅
Artificial Intelligence (AI) and Big Data Analytics	**Negative** ↓ (Acemoglu et al., 2020) Evidence of negative hiring effects (establishment level), but modest and non-robust effect sizes. No stat. signif. impact at occupation or industry level. No significant effect on changes in skills. **Classification: Exposure** (replacement risk) Frey and Osborne 2017: 47% of employment in the U.S.; (Weller et al., 2019): 24% in Latin America ∠ (Webb, 2019): Most exposed: high skill occupations (e.g., clinical laboratory technicians, chemical engineers, and power plant operators); smaller proportion of low skill jobs (inspection and quality control) **Least exposed**: occupations with high reasoning skills (e.g.researchers); interpersonal skill (e.g. managers, instructors, chefs, therapists) Brynjolfsson et al. 2018: occupations exposed to ML in different degrees. No full replacement

2D4D

Disruptive Digitalization For Decarbonization

elena.verdolini@unibs.it

Twitter: @2D4D_ERC, @e_verdolini

FUTURA EXPO
ECONOMIA X L'AMBIENTE 2·3·4 OTTOBRE 2022

40 1982 | 2022 UNIVERSITÀ DEGLI STUDI DI BRESCIA

RFF CMCC European Institute on Economics and the Environment

erc European Research Council
Established by the European Commission

2D4D: 5 anni

Additive manufacturing

Mobility as a Service

Ambient Intelligence

Industry model

Mobility model

Buildings model

Modelli di valutazione integrata

Decarbonization narratives

Politiche per la transizione

Raccolta dati e analisi empiriche	Narrative Modelli	Policy evaluation and design