



UNIVERSITÀ
DEGLI STUDI
DI TORINO



MIRRI

ERIC



ITALY

Progetto PNRR SUS-MIRRI.IT



**Strengthening the MIRRI Italian Research Infrastructure for
Sustainable Bioscience and Bioeconomy (SUS-MIRRI.IT)**



**Finanziato
dall'Unione europea**
NextGenerationEU



Ministero dell'Università e della Ricerca
Direzione generale dell'internazionalizzazione e della comunicazione

Avviso pubblico per la presentazione di proposte progettuali per *“Rafforzamento e creazione di Infrastrutture di Ricerca”* da finanziare nell'ambito del PNRR

Missione 4, *“Istruzione e Ricerca”* - Componente 2, *“Dalla ricerca all'impresa”* -
Linea di investimento 3.1, *“Fondo per la realizzazione di un sistema integrato di infrastrutture di ricerca e innovazione”*,
finanziato dall'Unione europea - NextGenerationEU



Budget complessivo: 16.904.434, 50 €

Budget UNITO: 5.842.655,78 €

24 UO appartenenti a 15 Istituzioni

UNITO coordinatore nazionale

UO01 - TUCC - UNITO

UO02 - CNR - ISA AVELLINO

UO03 - CNR - IPSP BARI

UO04 - CNR - ISPA BARI

UO05 - CNR - IBBA PISA

UO06 - CNR - ICB POZZUOLI

UO07 - CNR - IPSP TORINO

UO08 - CNR - IRSA VERBANIA

UO09 - ENEA - C.R. BRINDISI

UO10 - ENEA - C.R. CASACCIA

UO11 - ENEA - C.R. PORTICI

UO12 - ENEA - C.R. TRISAIA

UO13 - COSMI - OGS

UO14 - UNIBAS - SAFE

UO15 - MBDS-UNICA

UO16 - UNIGE - DISTAV

UO17 - UNIMIB - MICROMIB

UO18 - UNIMORE - UMCC

UO19 - UNINA - DIP. BIO.

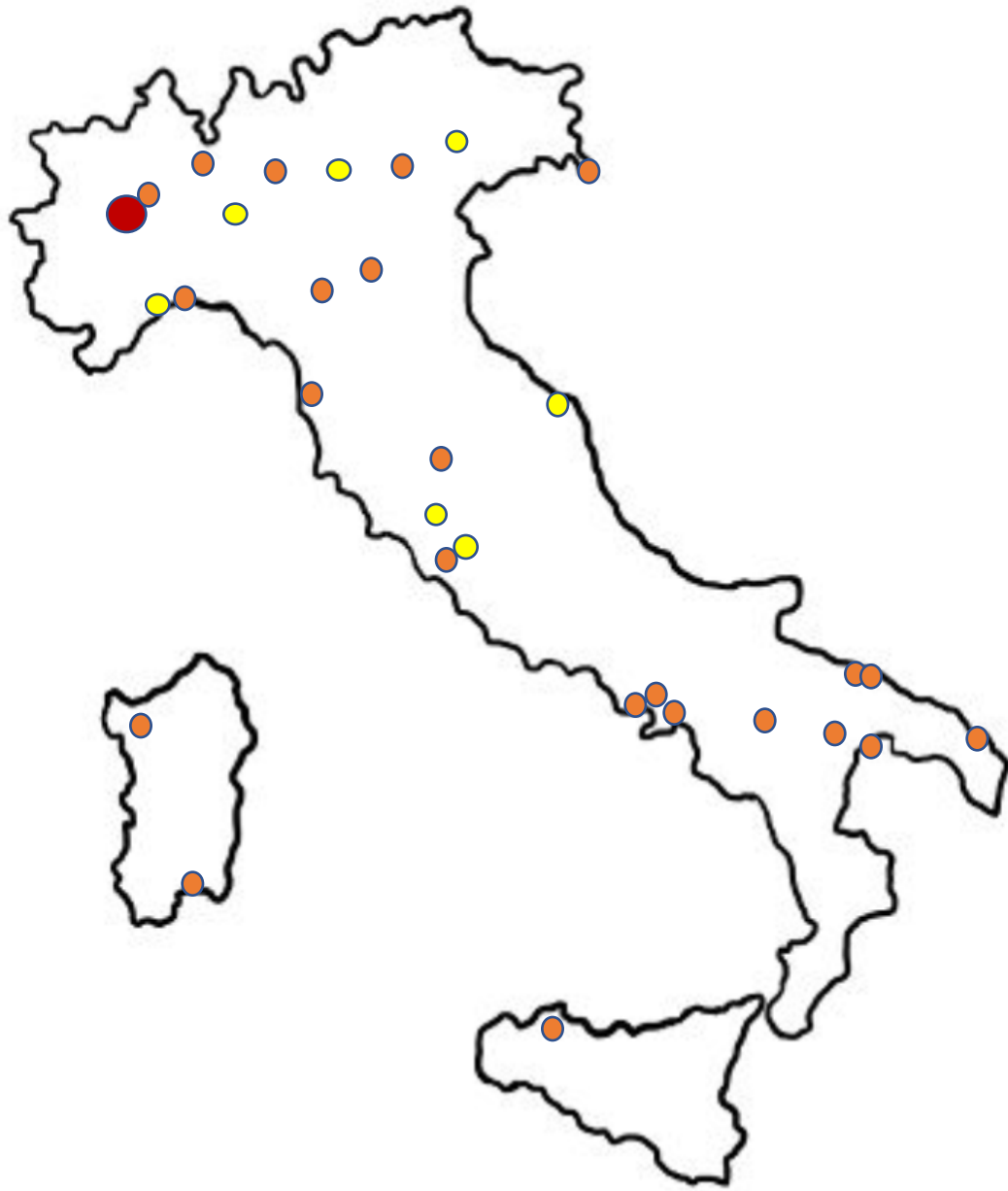
UO20 - UNIPA - SAAF

UO21 - UNIPG - DSA3

UO22 - UNIPR - ALIFAR

UO23 - MBDS-UNISSCC

UO24 - UNIVR - DIP. BIOTECH.



Joint Research Unit (JRU) MIRRI-IT
(www.mirri-it.it)

15 Istituzioni + altre 7 Istituzioni



**Rafforzare la rete nazionale delle
biobanche di microrganismi per
conservare e valorizzare la biodiversità
microbica e farne un centro di
riferimento europeo.**

I microrganismi sono la forma di vita predominante sul nostro pianeta, sia in numero, sia in biomassa totale



Ubiquitari nella biosfera e fondamentali per funzionalmento ecosistemi:

- ◆ regolano i cicli biogeochimici e il riciclo della materia organica;
- ◆ costituiscono i principali produttori e assorbitori di gas serra;
- ◆ svolgono un ruolo essenziale nel suolo (struttura e fertilità), e nella qualità e produttività di terra, mari, laghi e fiumi;
- ◆ Ricoprono le superfici di tutti gli altri organismi influenzandone fisiologia e benessere.

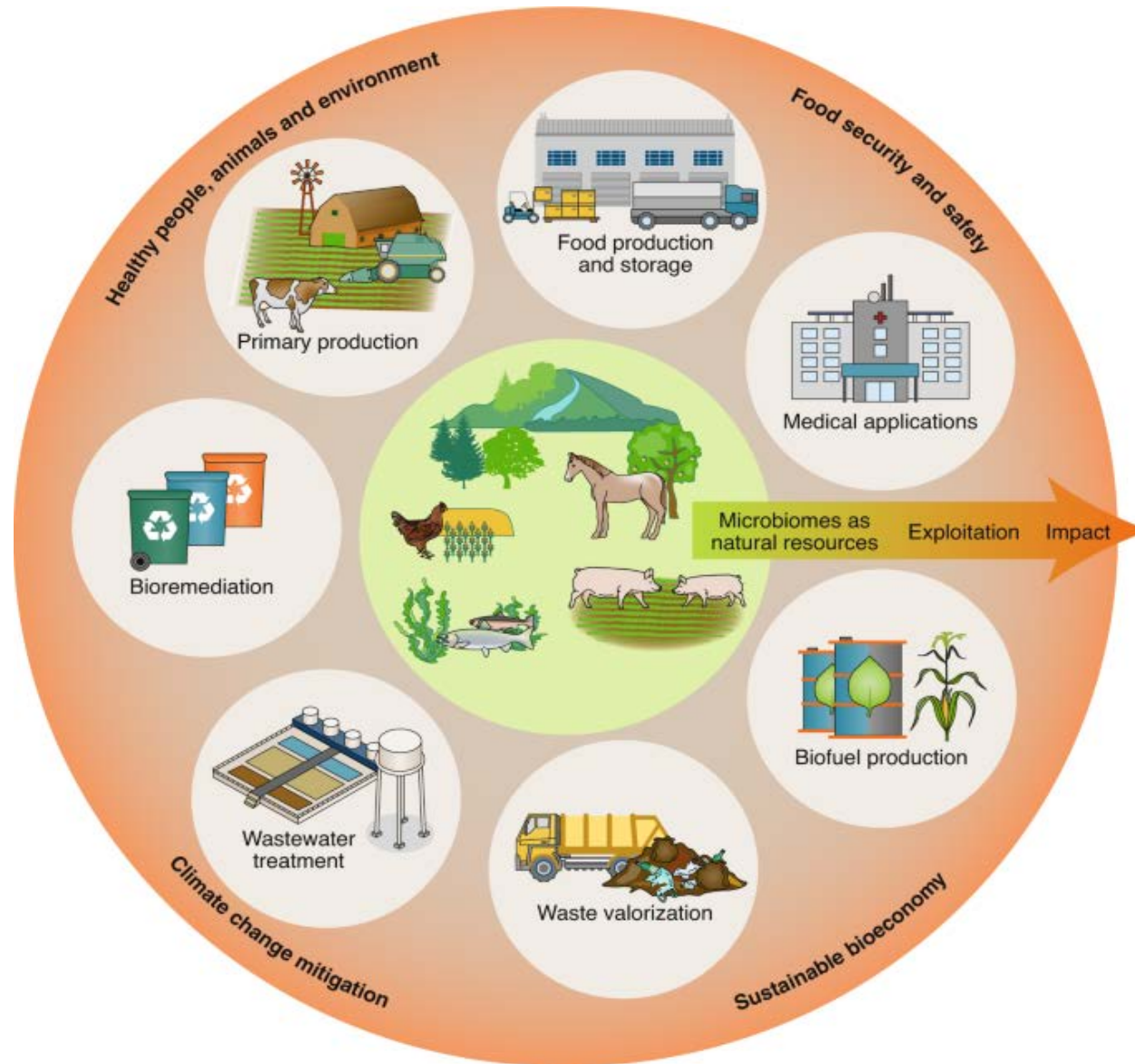
2.3 milioni di specie descritte

5 - 30 milioni di specie stimate



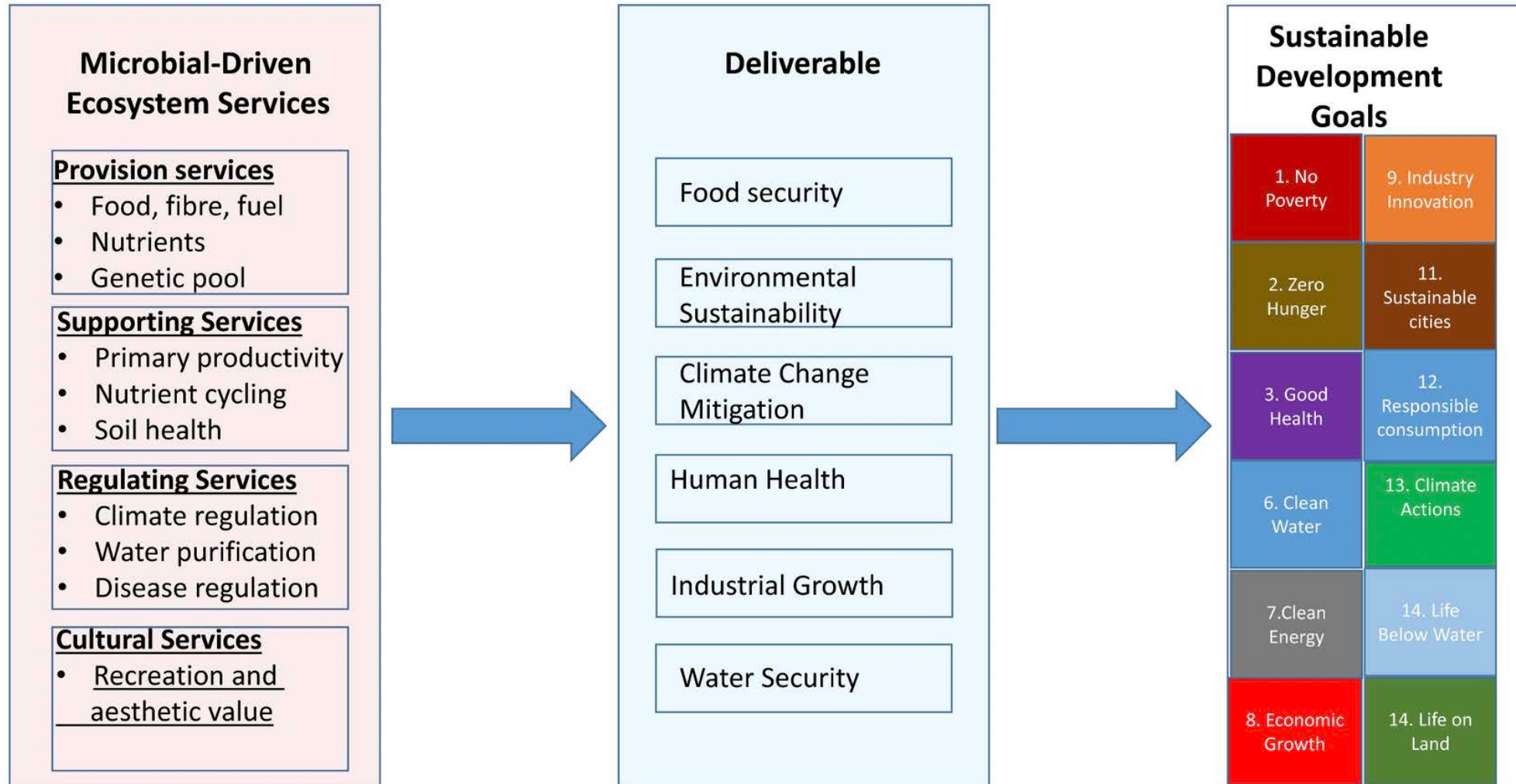
**>90% della biodiversità
microbica è ancora da scoprire!**

L'essenziale è invisibile agli occhi!



La biodiversità microbica è considerata una risorsa preziosa per la scienza e l'industria, con implicazioni per l'economia e la finanza.

Microrganismi come motore della bioeconomia e della sostenibilità ambientale per promuovere lo sviluppo globale, il benessere umano

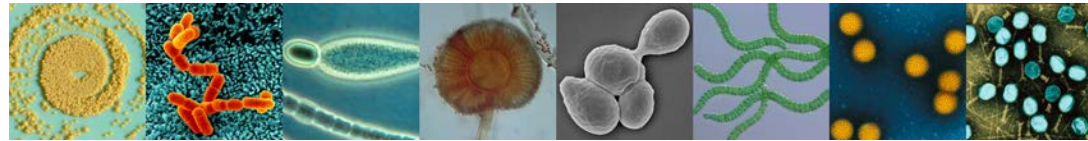


Le attività di SUS-MIRRI.IT

Work Packages	Principali obiettivi
1. Management, Governance and Sustainability	• Coordinamento del progetto e Gestione e supporto amministrativo • Qualità e gestione del rischio • Business plan e sostenibilità infrastruttura
2. CCs/mBRCs Strengthening	• Dotarsi di apparecchiature all'avanguardia per conservare e caratterizzare biodiversità microbica • Definire delle procedure standard comuni in qualità (QMS) • Disaster plan
3. On-line Platform and database	• Creazione della Piattaforma italiana x interazione con gli stakeholders • Catalogo delle Collezioni di microrganismi italiani • software per gestione database delle singole collezioni • Interoperabilità con piattaforme internazionali
4. Microbiomes: from sampling to exploitation	• SOP per il campionamento e l'analisi dei microbiomi • Protocolli per la conservazione sicura di microbiomi • Propagazione e riutilizzo di microbiomi in diversi ecosistemi
5. Services and education	• Identificazione fabbisogni del territorio • Realizzazione di servizi e corsi di formazione (catalogo nazionale) • Trans National Access
6. Communication and dissemination	• Creazione del sito web • Attività di comunicazione con Accademia e Bioindustria • Divulgazione scientifica per la società civile

SUS-MIRRI.IT riunisce e fornisce l'accesso, attraverso un unico portale, a risorse e competenze scientifiche eccellenti ...

- ✓ Ampio catalogo di circa 200.000 risorse microbiche di alta qualità e relativi dati associati



- ✓ Competenza scientifica in bioprospezione microbica, conservazione, culturomica, tassonomia, questioni legali / normative e istruzione / formazione.

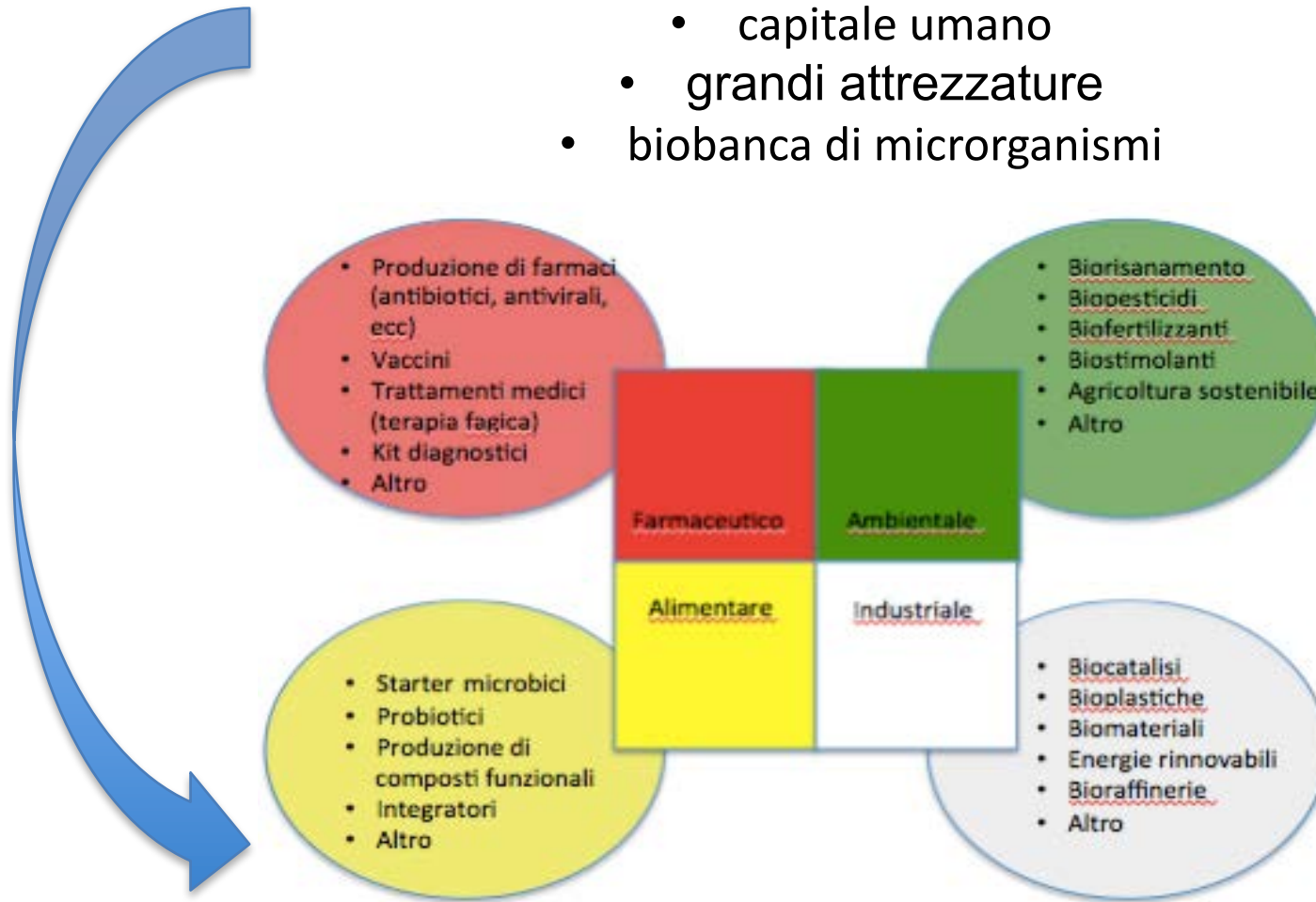


- ✓ Trasferimento tecnologico e formazione in diversi ambiti applicativi di grande rilevanza, quali Salute, Alimentazione, Agricoltura, Ambiente ed Energia (e loro intersezioni).



MIRRI-IT come “Microbiome innovation centre” distribuito sul territorio

I microorganismi alla base di tutte le biotecnologie.
MIRRI contribuisce a gestione sostenibile ambiente
e a ottimizzazione processi produttivi



MIRRI-IT garantisce:

- Accesso accademico e industriale alle risorse biologiche e ai relativi dati a livello nazionale ed europeo;
- Promuovere e supportare Consorzi di ricerca nazionali e internazionali;
- Promuovere tecnologie innovative;
- Contribuire a partenariati pubblico-privato.

Aumentare il beneficio che la società può trarre dalla conoscenza e dalla valorizzazione della biodiversità microbica.

MIRRI-IT è inserita in un contesto internazionale

Afferisce al network di >50+ centri di risorse biologiche dedicate ai microrganismi in Europa (**MIRRI - Microbial Resource Research Infrastructure**).



**Auspicabile che nelle
prossime settimane il MUR
sottoscriva l'entrata
dell'Italia nel MIRRI-ERIC
europeo.**

MIRRI si impegna a offrire ai propri utenti servizi di alta qualità, basati su tecnologie all'avanguardia...

DEPOSIT

Public Deposit

Patent Deposit

Safe Deposit

MICROORGANISM ISOLATION, PRESERVATION AND CULTIVATION

Isolation and purification of strains

Freeze-drying

Optimisation of preservation conditions
(including consortia and microbiomes)

Optimisation of cultivation/fermentation

Microbial counting/titer (phages, viable cells, spores, MPN...)

MOLECULAR IDENTIFICATION

Identification from pure cultures

Virus diagnostics

Cell line authentication

PHENOTYPIC CHARACTERISATION

MALDI-TOF MS

Image analysis (optical, fluorescent,
CLSM, TEM and SEM microscopies)

Biochemical tests (classical or miniaturised i.e. API, Biolog ...)

Analysis of the cellular fatty acid composition

Analysis of cell wall sugars

Analysis of peptidoglycan structure

Analysis of polysaccharide degrading enzymes

Analysis of the cellular polar lipid composition

Analysis of volatile metabolites

Analysis of ligninolytic enzymes

Analysis of mycolic acids

Analysis of respiratory quinones

Immunochemical analysis

MOLECULAR CHARACTERISATION, MOLECULAR TYPING AND PHYLOGENETIC ANALYSIS

Gene sequencing and analysis
(housekeeping/rRNA/virulence/drug-resistance genes, MLSA/MLST...)

PCR-typing (RAPD, DGGE, TTGE, AFLP,
Microsatellites, rep-PCR, Inter-LTR)

RFLP (genomic, mt-RFLP, ARDRA, ribotyping...)

MALDI-TOF MS

Karyotyping

Determination of ploidy

Plasmid profile analysis

NGS RELATED SERVICES

Draft/complete genome sequencing and analysis
(assembly, annotation, G+C...)

Overall genome relatedness index (ANI, DDH...)

Metagenomic analysis

SCREENING, TESTS AND BIOASSAYS

Growth promoting / antimicrobial bioassays

Screening (targets depend on the provider mBRC)

Characterisation of technology abilities

Characterisation of bioproducts (analytical, pharmaceutical)

Analysis of adhesive activity

Analysis of biosurfactant-producing activity

Analysis of hydrocarbon-oxidizing activity

Quality control and sterility testing of raw materials and products

Material resistance testing

MISCELLANEOUS

Assessment of Virus presence within fungal cultures

Cell sorting applications (Flow cytometry)

Construction of interspecific hybrids

Determination O₂ consumption / CO₂ production

DNA extraction

Down-streaming processing (metabolite purification)

House fungi diagnostic (e.g. *Serpula*)

Mycoplasma testing

Mycotoxin analysis

Plasmid copy number quantification (Droplet digital PCR)

Preparation of competent cells

Provision of inactivated strains

Safety assessment of strains for food and feed

Virus resistance assays

TAXONOMIC DATABASE TOOLS

MycoBank

YeastIP

FungalDC

Yeast-ID

Phylosearch

CONSULTANCY, TRAINING AND CONTRACT RESEARCH

Consultancy (taxonomy, handling and preservation of strains)

Consultancy (topics related to the mBRC expertise,
including legal and safety issues)

Training courses (content depends on the provider mBRC)

Contract Research (content depends on the provider mBRC)

MIRRI offre servizi integrati per specifiche pipelines in diversi campi di applicazione

HEALTH & FOOD

Diagnostic

Bacterial and fungal pathogens detection, isolation, characterisation and preservation under controlled conditions

Selection of reference pathogenic strains for bioassays and diagnostics

Bacterial genome scanning for investigation of virulence factors and antimicrobial resistance

Biopharmaceuticals

Identification of taxonomically related *Streptomyces* strains with antimicrobial activity using mass spectrometry profiles

Scanning of fungal genomes, identification of pathways for synthesis of biomolecules with pharmaceutical interest and heterologous expression of silent fungal gene clusters for bioactive compounds production

In vitro screening of anti-inflammatory and anti-infectious activities (antibacterial, antiviral, antifungal and antiparasitic) of newly isolated strains or strains preserved in mBRCs (including archaea, bacteria, cyanobacteria, yeasts and fungi isolated from untapped environments)

Preparation of inactivated strains to be used for the development of vaccines

Microbial based therapeutics and health promoting solutions

In vitro screening of phages for phage therapy as alternative to antimicrobials

In vitro screening for health-promoting properties i.e. production of organic acids, vitamins, aminoacids, GABA

Isolation and/or selection of strains with probiotic activity, screening of probiotic potential and analysis of resistance to gastrointestinal conditions

AGRO-FOOD

Food production processes

Food microbiome: metagenomic & culturomic analysis, fungal/yeasts/bacterial species isolation and identification

In vitro screening of food preservation activities: antifungal, antibacterial

Analysis of relevant metabolites for food production (e.g. exopolysaccharide, esters, superior alcohols, volatile compounds in wine production)

Microalgae strain selection and mass culture optimisation for aquaculture feed and food ingredients production

Food-waste products recycling: isolation, identification and characterisation of degrading strains

Food safety

Genome analysis for food safety strain requirements i.e. antimicrobial resistance (AMR), antimicrobial production, toxigenicity and pathogenicity

Food safety assessment based on genomic information (according to EFSA)

Analysis of mycotoxin profiles

Investigation of food contamination and identification of bacteria and fungi applying an integrated polyphasic approach (e.g. identification of *Alicyclobacillus* sp., frequent spoiler of fruit juices)

Agriculture

Selection and characterisation of arbuscular mycorrhizal fungi strains for application in agricultural and horticultural crops

Biofertilizers: identification and quantification for registry purposes

Biocontrol agents: identification and characterisation of strains used as biocontrol agents (e.g. *Trichoderma harzianum*)

Investigation of microbial activities with impact in soil nutrients (e.g. siderophore production, phosphate solubilisation)

ENVIRONMENT & ENERGY

Bioremediation

Compositional and functional characterisation of microbiomes from metal contaminated sites, strain isolation (cyanobacteria, bacteria, fungi, yeasts, microalgae) and taxonomic characterisation. Screening of tolerance to heavy metals

Screening of existing microbial resources (cyanobacteria, bacteria, fungi, yeasts, microalgae) for biotransformation of organic pollutants (e.g. phthalates, polycyclic aromatic hydrocarbons)

Characterisation of microbial communities, isolation of autochthonous strains or selection of strains in mBRC (bacteria, cyanobacteria, fungi, microalgae) for application in wastewater treatment processes

Biomass valorisation and bioenergy production

Assessment from genome annotation of specific enzymatic activities for biofuel production (e.g. hydrolytic activities) and *in vitro* validation in bacteria

Characterisation of microbial communities and/or screening and isolation of autochthonous strains for enzymatic activities aimed at biomass degradation and waste-to-energy valorisation

Microalgae strain selection, ecophysiology, growth and mass culture for biofuel production

Biomaterials and bioindustry

Bioplastics: production of polyhydroalkanoates

Self-healing concrete: strain for microbial calcium carbonate deposition and counselling for processes development

Analysis of relevant enzymatic activities with environmental and industrial interest (alginate, chitinase, lignolytic activity, agarase, amylase, β -glucanase, protease...)

Counselling for microbial bioprocesses: growth and productivity, screening of tolerances under technological conditions, analysis of biotechnological relevant behaviour (e.g. flocculation, foaming)

APPLICATIONS

ENVIRONMENT
& ENERGY

HEALTH & FOOD

AGRO-FOOD

BIOTECHNOLOGY

BIORESOURCES
& DATA

IDENTIFICATION &
CHARACTERISATION

ISOLATION & CULTIVATION

SAMPLING

ENVIRONMENT

mBRC

CUTTING EDGE TECHNOLOGIES

LONG-TERM PRESERVATION OF BIORESOURCES

- cryopreservation (robotic handling of samples)
- freeze-drying
- DNA encapsulation



DATA (FAIR)

- relational DB for accessing different type of information on MIRRI catalogues (metadata, genetic, phenotype)
- bioinformatics, statistics & machine learning

PCR TECHNOLOGY

- fingerprinting and taxonomic markers
- gene expression

LONG & SHORT READ SEQUENCING TECHNOLOGY

- whole genome sequencing
- microbiome analysis

MASS SPECTROMETRY

- MALDI-TOF MS for strain ID and typing
- high resolution Mass spec for proteomic and metabolites production

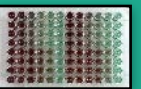


HIGH-THROUGHPUT SCREENING

- enzymatic activities (robotically conducted)
- physiological potential
- biological activities (antimicrobial resistance, toxin activity, ...)

REAL TIME ISOLATION/DISSECTION

- micromanipulator
- optical tweezers
- fluorescent activated cell sorting



CULTIVATION/CULTUROMICS

- high-throughput cultivation facilities
- rebirth of culture techniques



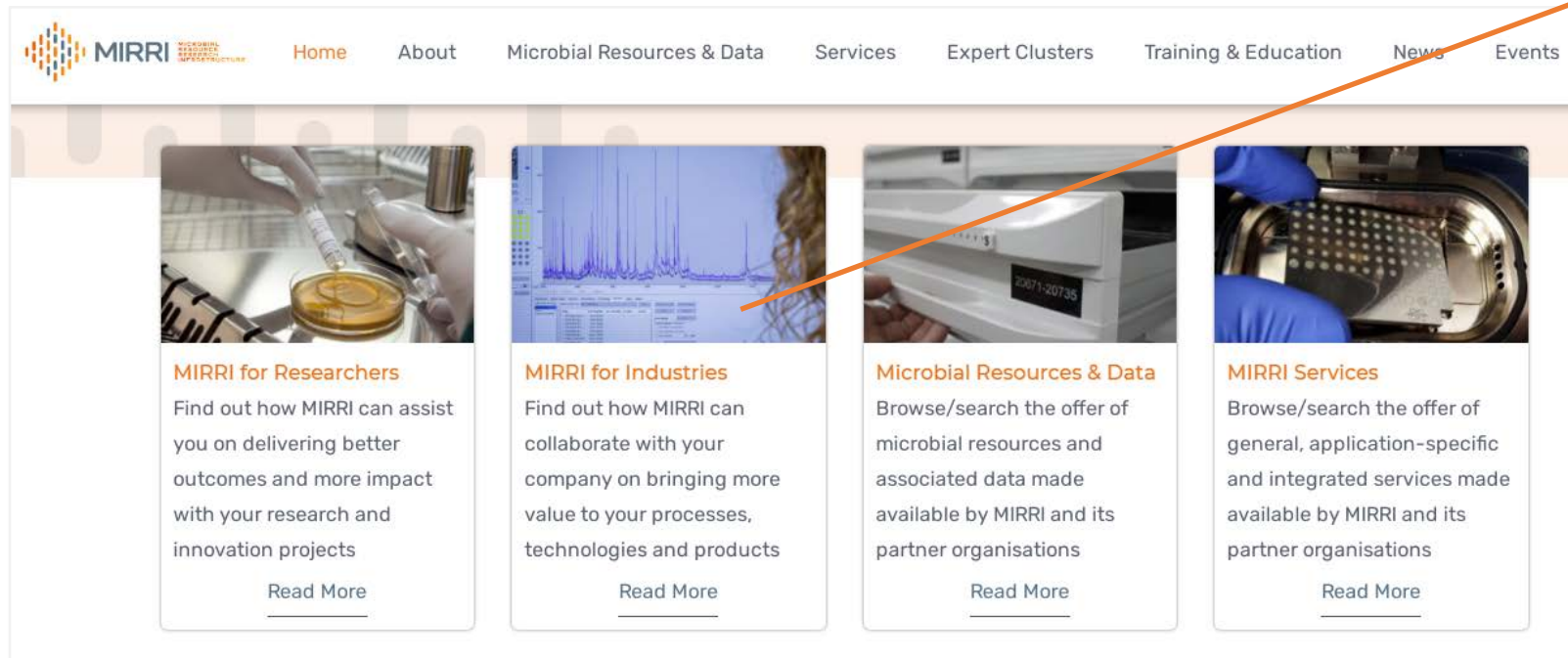
BSL-3 FACILITIES

- handling infectious strains or toxins
- immunization assays

... and MIRRI will always endeavour to level up its infrastructures and equipments with the highest standards.

- ✓ MIRRI will soon have in place, among others, an Expert Cluster dedicated to “*Applications & Technologies*”, having as some of its attributions to continuously scan the technological landscape for the latest developments and to provide guidance and advisory to the ApM, the INCF and the CCU on these matters (e.g., acquisition of cutting-edge technologies). Next October, MIRRI will be holding a workshop dedicated to “Cutting-edge technologies for 2030 microbial Culture Collections”.
- ✓ MIRRI will proactively try to contribute to and/or align its (or its national nodes and partner organisations’) strategy with national roadmaps and national/regional RIS3, since this should be an important condition for applying to competitive funds supporting the capacitation of research infrastructures.
- ✓ MIRRI will actively search for funding opportunities regarding the continuous upgrade of its facilities and the acquisition of cutting-edge scientific equipments.
- ✓ MIRRI will, whenever necessary, ensure the participation of its staff in advanced training courses for the uptake and use of cutting-edge technologies.

MIRRI-IT, attraverso la piattaforma dedicata, interagirà direttamente con il mondo accademico e industriale nazionale e fornirà un tramite con l'infrastruttura europea MIRRI-ERIC con strumenti specificatamente sviluppati per i diversi utenti.



WHAT WE OFFER

- Single point of access
- The broadest catalogue of high-quality microbial resources and data
- Cutting-edge services, techniques and technologies
- World-class scientific expertise
- Training opportunities
- Tailor-made, flexible and cost-competitive solutions

WHAT ARE YOU SEARCHING FOR?

Microbial resources & Data

Services

Expert clusters

Training & Education

MIRRI- IT contribuirà in modo proattivo al raggiungimento delle strategie nazionali e regionali.

TORINO capitale dei microrganismi



Turin University Culture Collections:
una biobanca microbica al servizio dell'Accademia e dell'Industria:
> 20.000 ceppi microbici



8 Dipartimenti:

- Scienze della Vita e Biologia dei Sistemi
- Scienze Agrarie, Forestali e Alimentari
- Scienze della Sanità Pubblica e Pediatriche
- Scienze Veterinarie
- Chimica
- Informatica
- Management
- Giurisprudenza

UNITO riunisce le risorse microbiche presenti presso l'Ateneo ottimizzandone la gestione e assicurando una maggiore accessibilità alle risorse e ai servizi per la comunità scientifica e industriale seguendo criteri di qualità e certificazione riconosciuti a livello internazionale.

MIRRI e la Città della Scienze e dell'Ambiente di Grugliasco



Grazie a questo Progetto si crea un Centro di Eccellenza presso **la nascente Città delle Scienze e dell'Ambiente di Grugliasco** con nuovi spazi dedicati. La vicina presenza della “Butterfly Area” favorirà l’interazione con il mondo industriale.

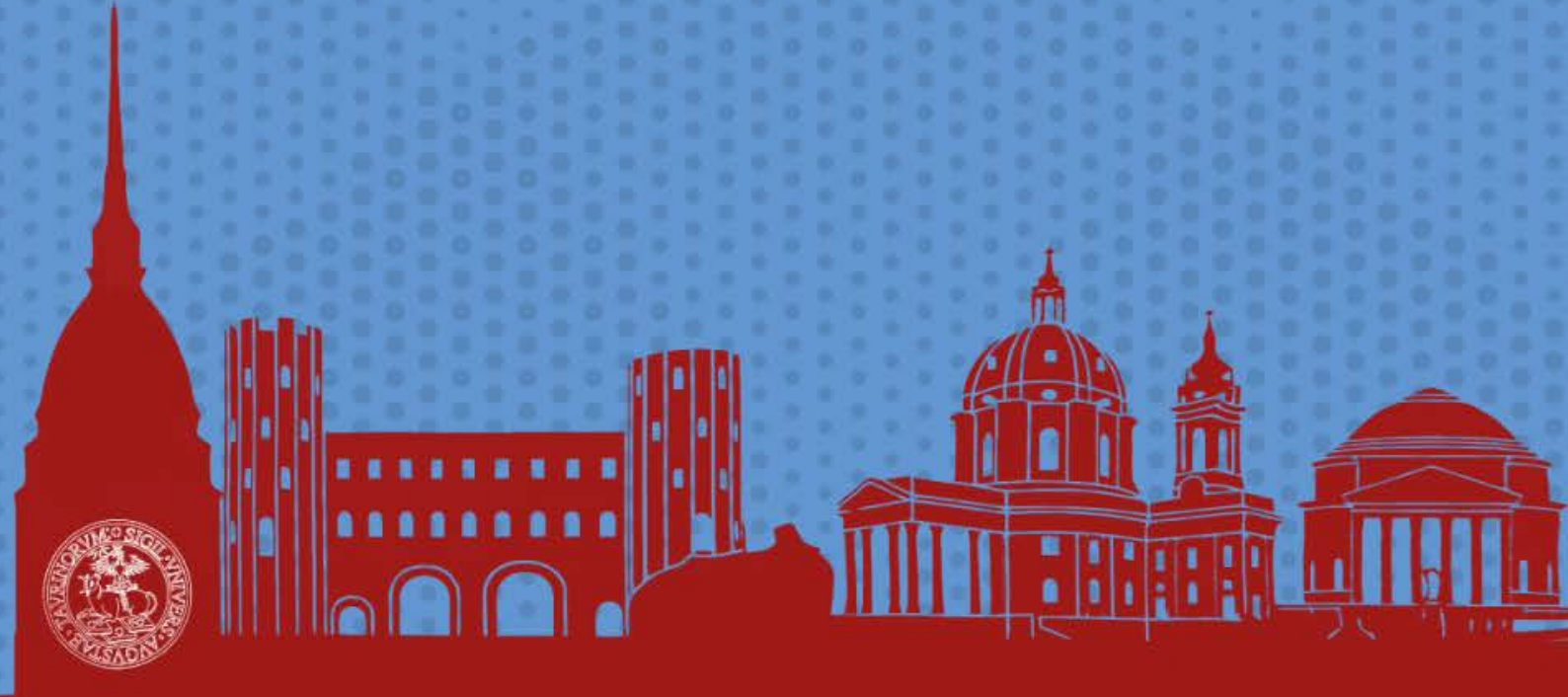
Questo centro, sarà un fiore all’occhiello nel panorama nazionale e internazionale in grado di fornire servizi innovativi per affrontare le grandi sfide della società agendo come volano per lo sviluppo del territorio.



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GRAZIE PER L'ATTENZIONE