

# SUSTAINABLE NANOMATERIAL-BASED SENSORS FOR SMART DIAGNOSTICS

## Bridging EU and Twinning Countries

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# The Catalan Institute of Nanoscience and Nanotechnology (ICN2)





# The Catalan Institute of Nanoscience and Nanotechnology (ICN2)



**A cluster with nearly 750 scientists and technicians in the areas of Materials, Micro and Nanotechnologies.**

# OUR RESEARCH @ICN2

## DEVELOPMENT OF SUSTAINABLE NANOMATERIAL-BASED SENSORS FOR SMART DIAGNOSTICS

### Nanomaterials

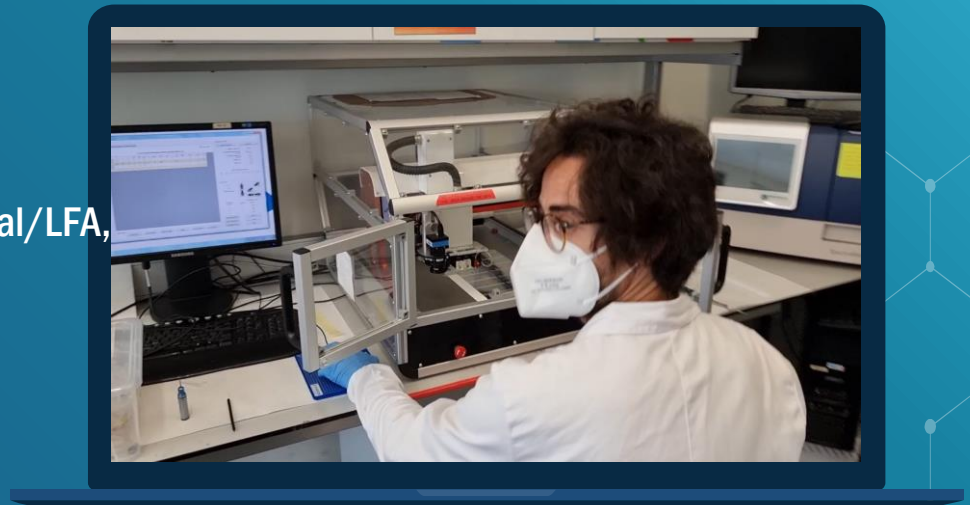
Graphene and 2D materials,  
Metal nanoparticles, quantum dots

### Paper-based

Lateral flow assay, hybrid electrochemical/LFA, optical readout

### Printing technologies

Inkjet printing, screen printing, graphene transfer electrodes, FET-based biosensors, electrochemical readout



### Fully integrated PoC devices

Smartphone based, wearables, wireless readout

A person is seen from behind, sitting in an office chair at a desk. Their hands are clasped behind their head, and they are looking at a computer monitor. The image is framed by a blue geometric design consisting of two large triangles meeting at a central vertical line. The text "WHY DO WE NEED SUSTAINABLE DIAGNOSTICS?" is overlaid in white, bold, sans-serif capital letters across the center of the image.

**WHY DO WE NEED SUSTAINABLE  
DIAGNOSTICS?**



# COVID-19: A tremendous real world example

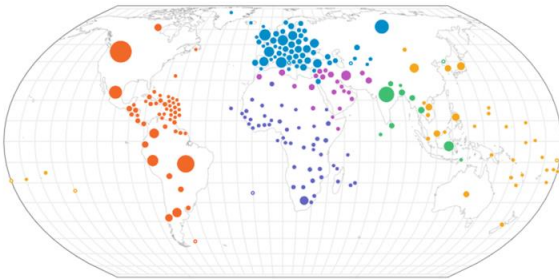
## We have been living through a global crisis

## Showing the necessity of efficient diagnostics

## for the protection of us all

Number of COVID-19 deaths reported to WHO (cumulative total)

World



WHO Regions

Africa Americas Eastern Mediterranean Europe  
South-East Asia Western Pacific

7,073,466

+641

Increase on previous 7 days

Reported COVID-19 deaths

World, 7 days to 27 October 2024

Number of COVID-19 deaths reported to WHO (cumulative total)

World

Country Deaths

World	7.1m
United States of America	1.2m

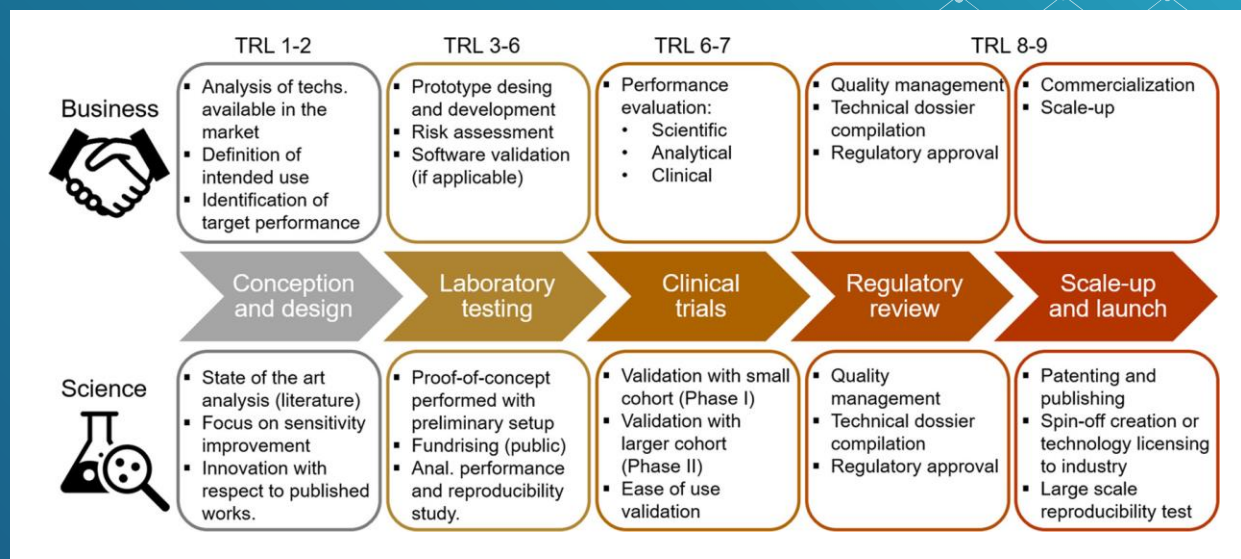
DIAGNOSTICS  
TOOLS ARE CRUCIAL



# How COVID19 changed the scenario

The development of new diagnostic devices is a process characterized by several bottlenecks. Most of them related to sub-optimal interactions between the actors involved, i.e.:

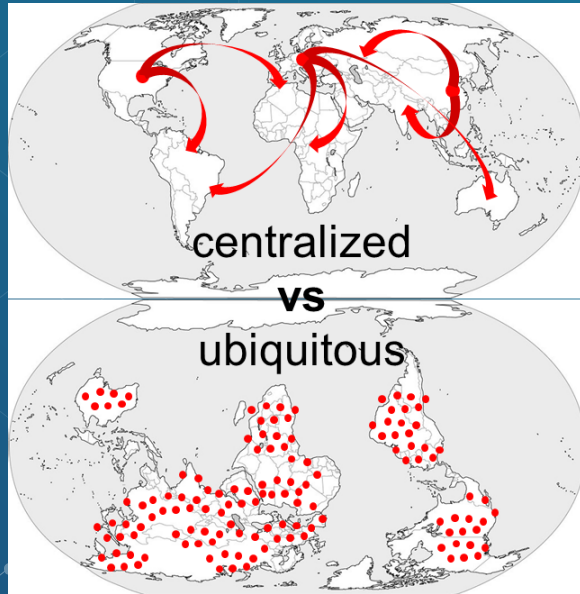
- The scientists
- The clinics
- The regulatory bodies
- The companies



What can we do to change the status quo?



# Ubiquitous fabrication of nanobiosensors



Centralized production of  
nanobiosensors



Ubiquitous fabrication  
of nanobiosensors



With appropriate materials, inks, and easy protocols, a consumer printer can be used to fabricate advanced nanobiosensors, successfully facing supply chain interruptions and democratizing these technologies



# DEMOCRATIZE THE DIAGNOSTICS

**The present**

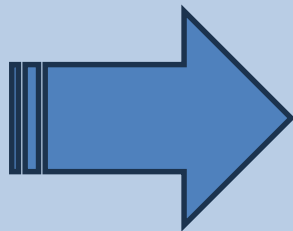


**Our future**

- Innovative nanomaterials and nanotechnologies
- In-situ and easy production
- Low-cost scalability
- Portability
- Sensitive, reproducible
- Equipment-free







**2024**

**Nanotech Regional Centre of Excellence**

**NANOALKAN**



## What is NANOBALKAN ?

- ➔ A virtual center of NanoScience and Nanotechnology
- ➔ Created in 2019 next to and with the support and next to the Academy of Sciences of Albania.
- ➔ NANOBALKAN is aiming to be a center for nanotechnology, uniting 30 research groups from Albania, Kosovo, North Macedonia, and associated groups from Greece, Israel, Italy, Serbia, Spain.
- ➔ Following the model of the Catalan Institute of Nanoscience and Nanotechnology (ICN2) in Barcelona, Spain a distinguished research institution at international level.

# NANOALKAN's research and development domains

- ➔ **HEALTH** (disease diagnostics, advanced therapies)
- ➔ **AGRICULTURE** (innovative fertilizers, food protection)
- ➔ **ENVIRONMENT** (pollutant monitoring, remediation)
- ➔ **NOVEL MATERIALS DEVELOPMENT** (for construction and other industries/ future applications in the semiconductor/chip industry).

## NANOALKAN's mission

- ➡ Hosting research groups from across the region and satellite/Twinning groups from EU and more.
- ➡ Offering services and fostering collaborations between various regional research centres.
- ➡ Facilitating remote experiments and communication for research groups/labs in the region that cannot physically be present in Albania.
- ➡ Planning in the future to establish future satellite centers across the region, adapting to the unique needs and priorities of each country, and replicating NANOALB/NANOALKAN's model of excellence.

This initiative is poised to play a pivotal role in advancing the field of nanotechnology in the region, promoting scientific excellence, fostering collaborative research and development, attracting and retaining talent, securing EU competitive funding, and encouraging private investment in high-tech industries, among other benefits.



# CONCLUSIONS

- Development of sustainable nanomaterial-based sensors for smart diagnostics is a great opportunity to bridge EU and twinning countries
- NANO BALKAN regional center will be serving to such aim
- Talents attraction and retention
- Impact in science and education
- Industrial impact (high-tech)





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Kostya Novoselov  
NUS, Singapore  
Plenary Talk



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# Thank you!

# Questions?

