1 - 2 DÉCEMBRE 2022 | PALAIS DES CONGRÈS DE PARIS FRANCE

JIB 65e ÉDITION JOURNÉES DE L'INNOVATION EN BIOLOGIE

EFLM EUROPEAN FEDERATION OF CLINICAL CHEMISTRY AND LABORATORY MEDICINE

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IMPLEMENTATION OF SUSTAINABLE PRACTICES IN MEDICAL LABORATORIES

Switching Clinical Laboratories to Green Labs

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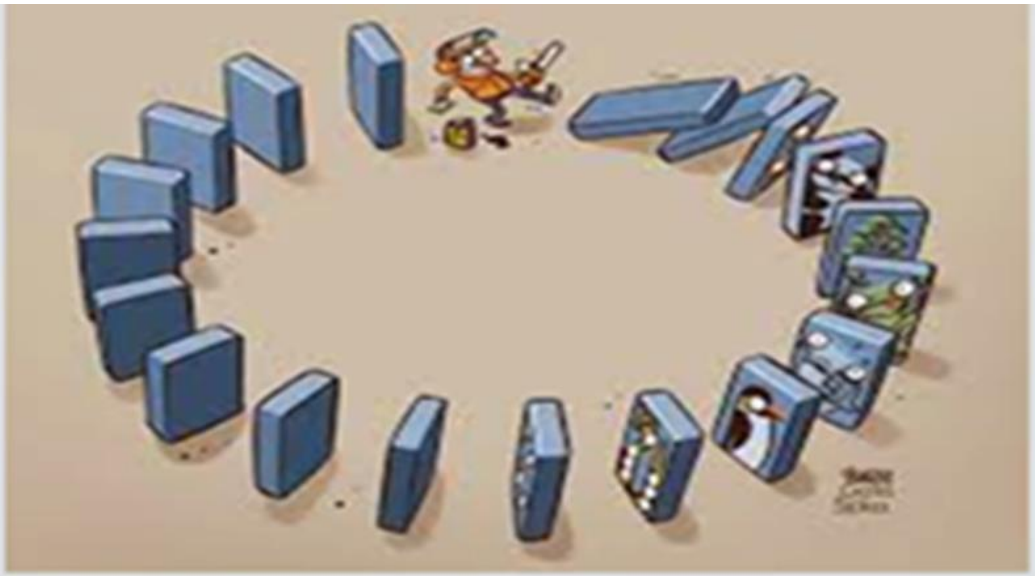
EFLM, President

EFLM Task Force-Green Labs, Chair

ENVIRONMENT and CURRENT SITUATION

- ENVIRONMENT is the external conditions with which an organism interacts.
- This interaction has been going on since the existence.
- Environmental issues have become more widespread and intense due to increasing industrial and human impacts on the environment.
- Environmental unconsciousness and excess consumption caused deterioration and exhaustion of natural resources.
- Rapid population growth has triggered this situation.
- **50% of the world' s current environmental pollution has occurred in the last 35 years.**

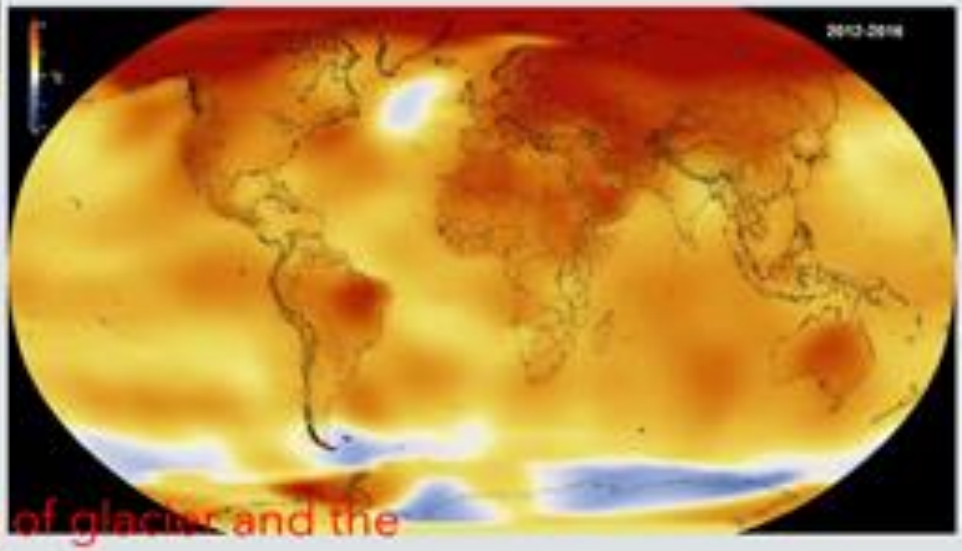
Environmental Awareness; An important approach to prevent environmental pollution.



The COVID-19 crisis and the climate climate and biodiversity loss are deeply connected
Biodiversity loss can cause changing hosts of the pathogens

GLOBAL PROBLEMS ARE GROWING
OUR WORLD IS SOUNDING THE ALARM !!!!
OUR NATURAL RESOURCES ARE DIMINISHING
OUR WORLD IS WARMING-CLIMATE IS CHANGING

drought floods pandemic melting of glacier and the permafrosts



Foundations of Sustainability

A.Eren Öztürk *(S360 Senior Partner, Strategic Leadership and Learning Design Lead)*

European Green Deal (EGD)

- The European Commission in line with the Paris Agreement for climate adopted in 2015 has taken some initiatives to decrease carbon footprints.

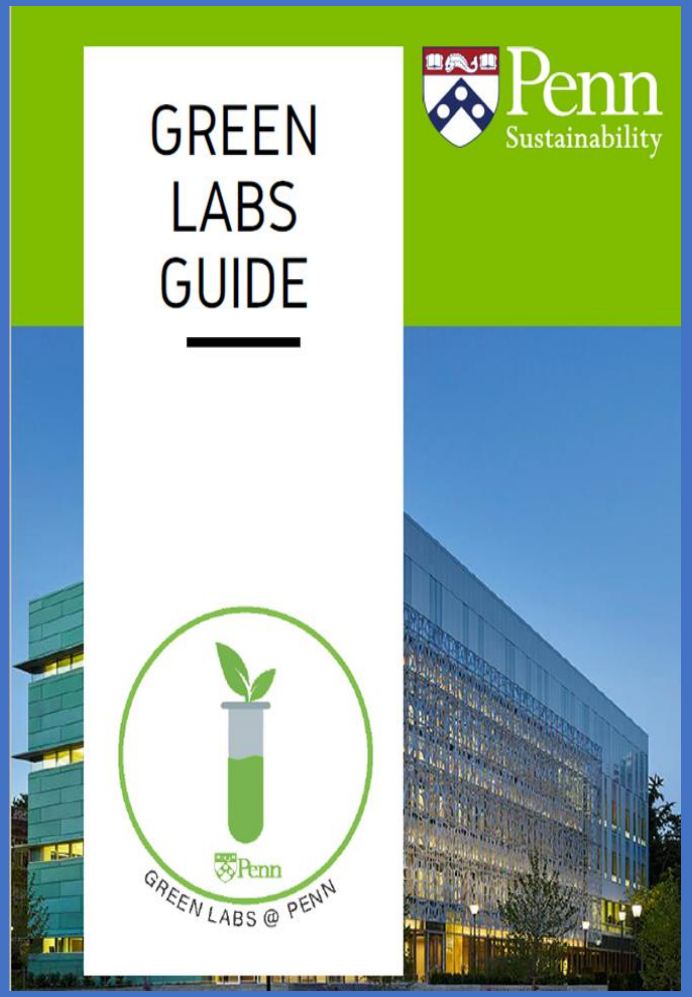
- The **European Green Deal (EGD) Investment Plan**, also known as the **Sustainable Europe Investment Plan**, is aimed at making Europe the world's **first climate-neutral continent by 2050.**

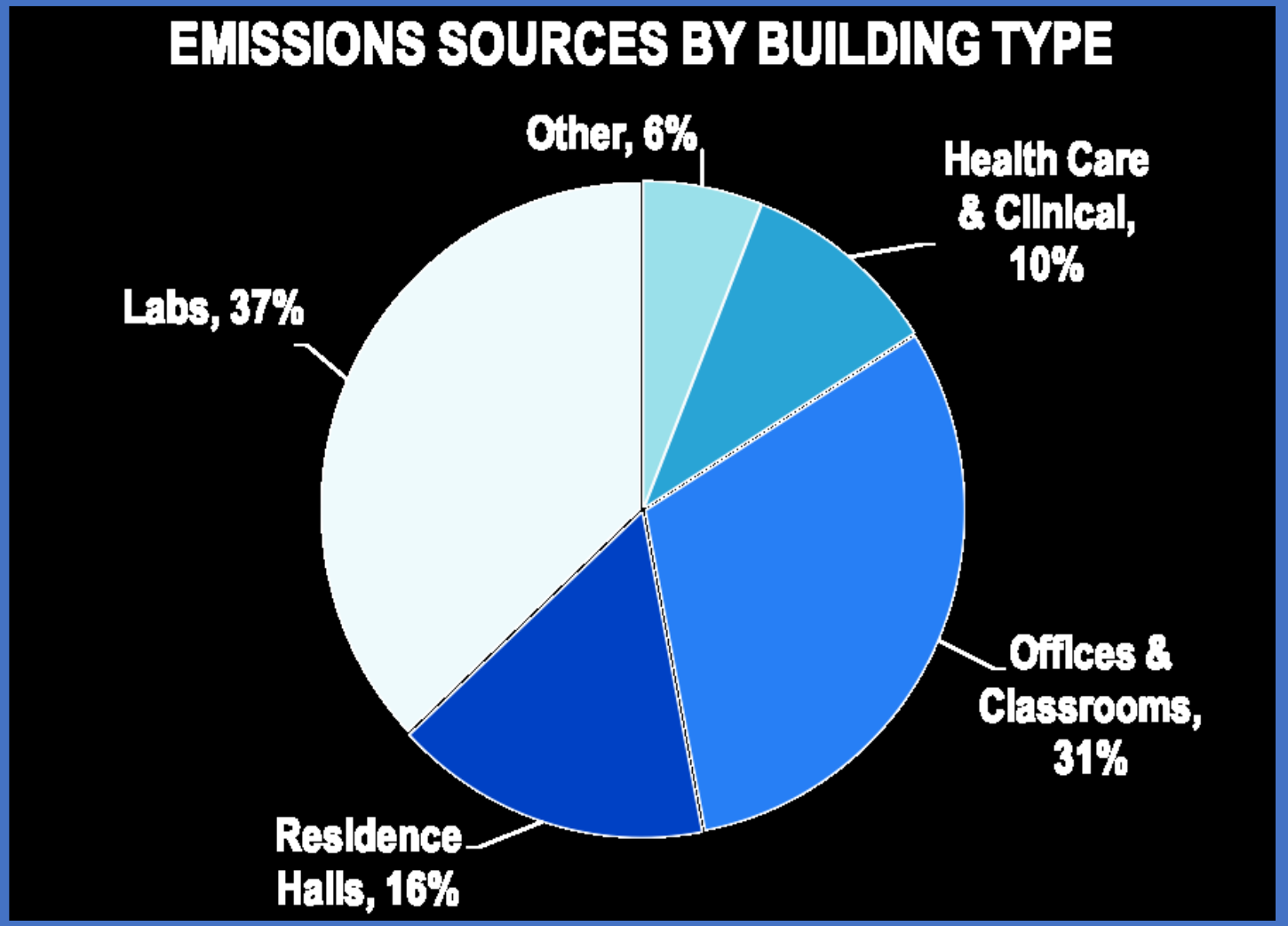
SUSTAINABILITY IN LABORATORY MEDICINE. GREEN LABS

Clinical laboratories are large consumers of energy and comprise the largest percentage of carbon emissions. Labs use also more water than offices and generate huge amounts of hazardous waste every year.

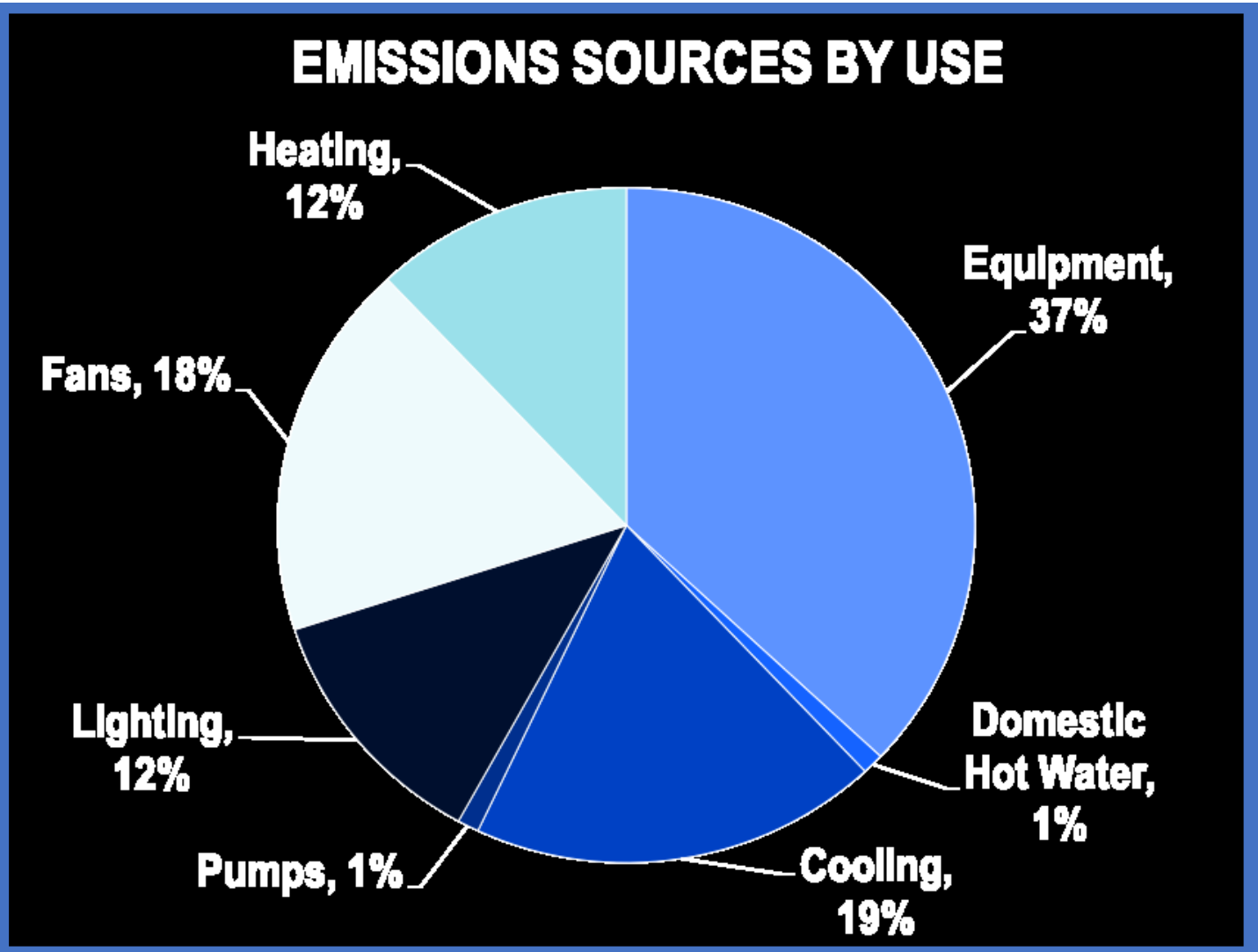
Due to their relatively high energy requirements, hospitals and laboratories must shift to renewable energy sources to achieve the long-term CO_2-reduction targets set by the European Commission.

Incorporating sustainable practices into daily lab routine will go towards saving energy, reducing emissions, and helping the European Green Deal (EGD) to reach its Climate and Sustainability Action Plan.





https://www.sustainability.upenn.edu/penn-community/green-labs



https://www.sustainability.upenn.edu/penn-community/green-labs

SUSTAINABILITY IN LABORATORY MEDICINE. GREEN LABS

- Sustainability is important in a rapidly changing healthcare environment.

- Sustainability measures in the healthcare sector are needed to reduce its negative impacts on the environment and economy.

- **Laboratory medicine** should contribute to a **sustainable healthcare system** ensuring that **resources** are used efficiently from **ecological, social, and economical perspectives, while providing high-quality services to patients and physicians.**

EUROPEAN FEDERATION OF CLINICAL CHEMISTRY AND LABORATORY MEDICINE

EFLM TASK-FORCE GREEN and SUSTAINABLE LABS

Chair: Tomris Ozben

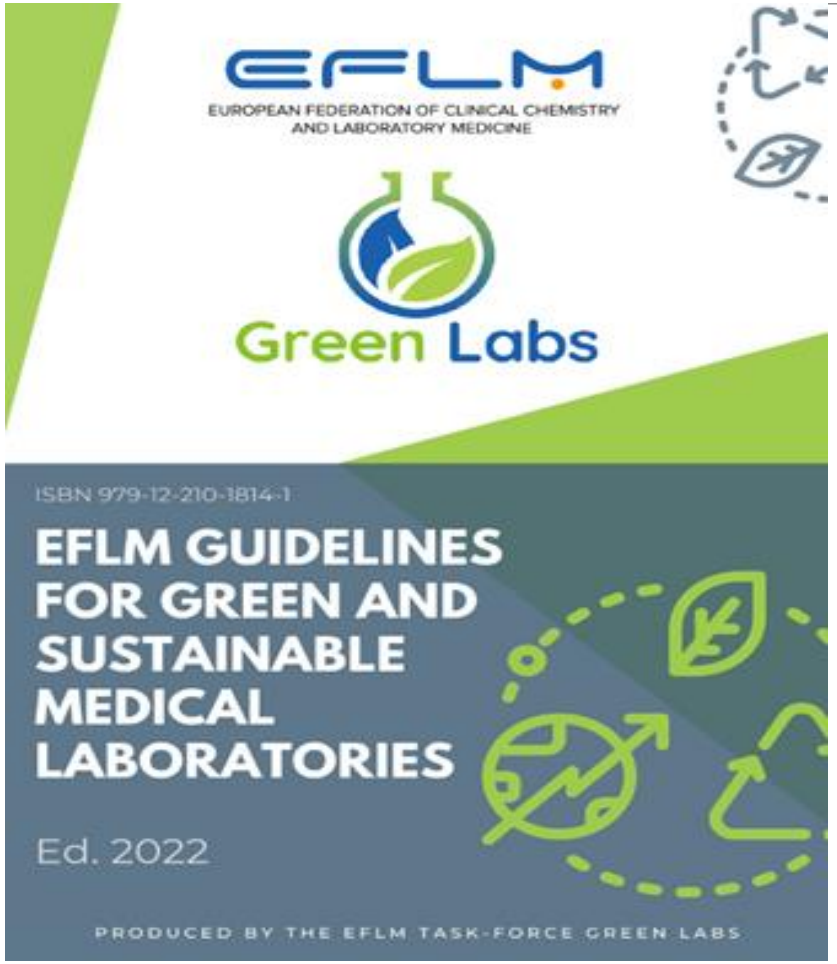
aimed
to implement
sustainable
practices
in medical
laboratories

ENVIRONMENTAL MANAGEMENT SYSTEM
ISO 14001

EFLM and its Member Societies will lead the laboratory medicine community for the shift to carbon neutrality in line with the European Green Deal (EGD) Investment Plan, which is aimed at making Europe the world's first climate-neutral continent

EUROPEAN FEDERATION OF CLINICAL CHEMISTRY AND LABORATORY MEDICINE

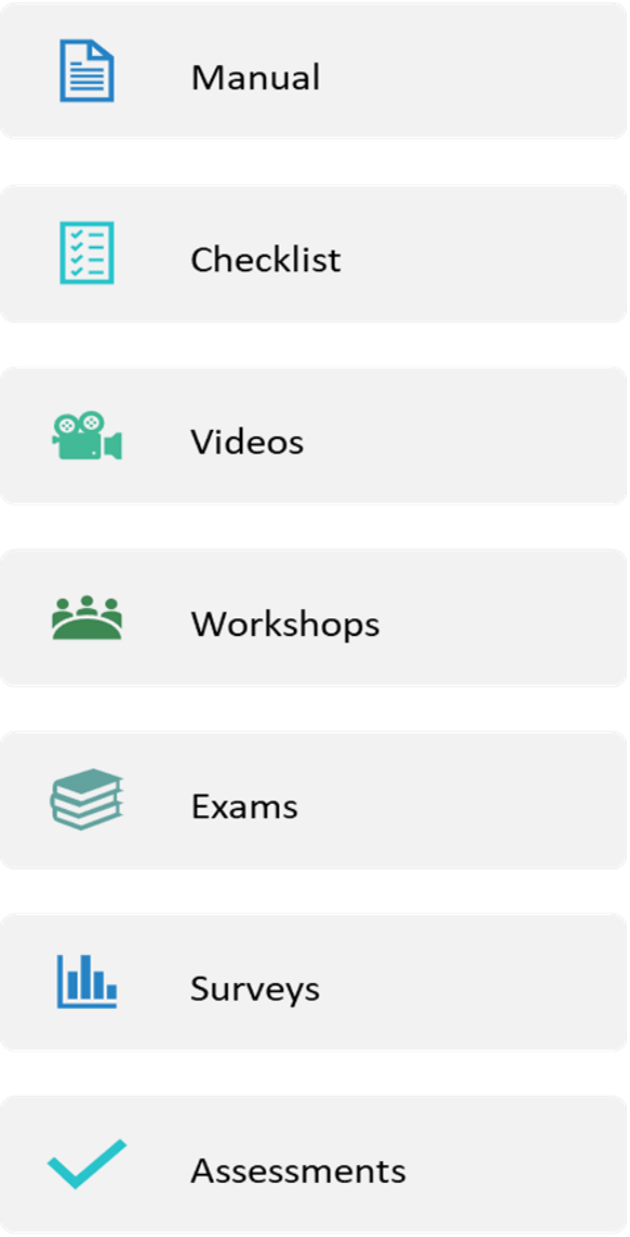
EFLM GUIDELINES FOR GREEN AND SUSTAINABLE MEDICAL LABORATORIES



To help EFLM National Societies in the transition to Green Lab!

EFLM Task-Force Green Labs first goal!

Completed activities of the EFLM Task Force "Green and Sustainable Labs" (2022)



1. **The official establishment** of the EFLM Task Force Green Labs was announced to the
   - -EFLM National societies,
   - -EFLM and IFCC newsletters,
   - -EFLM mailing list of 10000 contacts and announcement via socials.
2. **EFLM National Societies** were invited to name an officer acting as NS Representative for the Task Force-Green Labs. The new initiative of EFLM "Green Labs" has been appreciated by the EFLM National Societies and they appointed **49 National Society Representatives** in addition to the **Task Force-Green Labs core members.** https://eflm.eu/site/page/a/1732
3. The European Commission (EC) entitled **"European Green Deal (EGD)** was informed about the establishment of the EFLM Task Force-Green Labs. EC Commissioner EGD Executive Vice President and his cabinet are following our activities closely. They expressed congratulations for the establishment of the EFLM TF-Green Labs. We are in close contact with the EGD Commission in our further progresses.
4. **MedTech Europe** was informed at the same time. They were interested with the EFLM initiative and appointed their Senior Manager on "Environment & Sustainability" to the EFLM TF-Green Labs as a TF member.
5. A session was dedicated at the **EFLM Strategic Conference**. http://www.eflm-strategic-conference.eu/
6. **Guidelines, Checklists, PowerPoints, video recordings** on main topics: Energy, Waste, Water, and Chemicals were completed. A logo was prepared, and ISBN code was received for the guidelines.
7. They were shared with the 49 delegates appointed by the national Societies in EUROPE.

Actions and Plans for the EFLM Task Force "Green and Sustainable Labs" (2023)

- Manual
- Checklist
- Videos
- Workshops
- Exams
- Surveys
- Assessments

8. Preparation of an app. for assessing the applications

9. Training 49 National Society Representatives to become Green Lab Delegates in their countries.

10. Meetings with the National Societies (Presidents, National Representatives, members).

11. Organize a Workshop for the whole EFLM Community.

12. Launch a call to receive "Green and Sustainable Lab Certificate" applications from Laboratories.

13. Evaluation/assessment of the applications using app.

14. EFLM Green and Sustainable Lab Certificates to be given to the laboratories fulfilling the EFLM Green Lab requirements.

EFLM Green Labs Program
Reductions in Four Key Areas

Through simple, easy changes, and making reductions in four key areas, clinical laboratories might limit their environmental impact and provide sustainable laboratory services By being mindful of the environmental impact of everyday actions in a lab, and by **taking simple, easy steps to minimize energy, water, and hazardous chemical use, as well as waste generation, a clinical lab can be transformed into a green and sustainable space.**

- energy consumption
- water consumption
- waste production
- use of hazardous chemicals

STRATEGIES
GREEN and SUSTAINABLE LABORATORIES

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- the consumption of energy, water
- natural resources
- unsafe products, hazardous chemicals

- as much as possible before replacing

- preventing waste
- reduce the consumption of fresh raw materials, energy usage, air and water pollution

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Green Labs

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Energy Management

- Reduce energy consumption in the laboratory's workflow.
- Reduce gasoline consumption by laboratory logistics and staff.
- Design eEnergy-efficient and environmentally friendly laboratory/hospital buildings.
- Use of renewable energy sources when and where possible.
- Collaborate between laboratory networks for resource sharing.

HOW CAN LABS REDUCE ENERGY CONSUMPTION?

- Turning off equipment when it is not in use is one of the easiest and most obvious ways to save energy.
- If equipment has a warm-up time or a set temperature, simply put it on an outlet timer to ensure that it is ready when lab operations begin.
- Labs should also consider purchasing freezers having Energy Star certification.
- A transformation in cold storage has occurred over the past few years, with **energy-efficient ultra-low temperature freezers** and **-20°C freezers** now available. **These freezers often consume 50-60% less energy than standard freezer models.**
- **Send less emails:** Each email sent emits **4g of CO_2** to the atmosphere and if the email includes an attachment, it emits another **50 g of CO_2 or** more. You can select “upload to ONEDRIVE” when sending large attachments, which minimizes the carbon footprint.

Water Management

Less than 1% of the Earth's water is freshwate .

Less than 40% of that is unpolluted.

→ Minimising water consumption ensures that there is more clean fresh water available for all species.

The water services industry is the fourth most energy intensive sector in the EU.

→ Minimising water consumption can further cut energy use and carbon footprint.

Labs consume 1-3 m^3 of water / m^2 of floor area

Based on a typical laboratory of 5 000 m^2 this translates into an annual water consumption of between 5 000-15 000 m^3

S-LAB ENVIRONMENTAL GOOD PRACTICE GUIDE FOR LABORATORIES - A REFERENCE DOCUMENT FOR THE S-LAB LABORATORY ENVIRONMENTAL ASSESSMENT FRAMEWORK VERSION 1.0 OCTOBER 2011 ©S-LAB

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Green Labs

General Good Practices for Water Conservation

https://www.jalbharat.com/rainwater-harvesting-for-a-better-tomorrow/

Use	Rinse	Run	Monitor	Improve	Use	Adopt	Collaborate	Use
Use purified water appropriately and sparingly (producing it by reverse osmosis)	Rinse bulky glassware or equipment with regular tap water before utilizing deionised water for the last stage of rinsing	Run autoclaves and sterilizers at full capacity and run dishwasher only when it is fully loaded	Monitor consumption to detect leaks and to identify improvement opportunities	Improve laboratory process equipment (cooling of equipment, rinsing, and flow control)	Use of alternative water sources(air-conditioning condensate recovery and rainwater harvesting)	Adopt of a green purchasing policy (buy water efficient devices)	Collaborate between hospital buildings and laboratory networks for resource sharing	Use alternative source of water for nonpotable water: •Recover condensate water •Harvest rainwater as another source for non potable water use •Reclaim wastewater for some non potable applications such as cooling tower make-up

HOW CAN LABS REDUCE WATER CONSUMPTION

Meter/monitor water consumption

- Install low-flow aerators on lab faucets. Most lab faucets run at 16 liter/minute even though most standard faucets are equipped with low-flow aerators, inexpensive devices restrict the flow of water to 6 liter/minute or less.
- Reduce using of tap water
- Install or use timers on critical or continuous water uses
- Install flow restrictors with balanced pressure
- Install sink aerators
- Install water misers
- Install data-logging water meters
- Conduct a water audit
- Maintain proper functioning of the plumbing system
- Check for faucet leaks and other leaks on autoclaves, ice machines, water-cooled equipment

Select / use equipment & instrumentation wisely

- Conduct a **pre-purchase water consumption assessment** of equipments/instruments
- Give priority to **low water consumption** items, to manufacturers who use **environmentally friendly manufacturing processes** and/or to those who have **ISO certification for good environmental practices**
- (If possible) include a **green element to procurement**

EFLM GUIDELINES FOR GREEN AND SUSTAINABLE MEDICAL LABORATORIES: (ISBN. 979-12-210- 1814-1) WATER MODULE. S. Stankovic, F. Sagin

WASTE MANAGEMENT

- About 85% of the total amount of waste generated by health-care activities is non-hazardous waste. The remaining 15% is considered hazardous material. They may be infectious, toxic or radioactive.
- 25% of the generated plastic waste is landfilled. Half of the plastic collected for recycling is exported to be treated in countries outside the EU.
- Laboratory plastic wastes are bagged and “autoclaved” – an energy- and water-intensive sterilization process often using pressurized steam – and then they are sent to landfill.
- No activity should begin unless a plan for the disposal of non-hazardous and hazardous waste has been formulated.
- While the impact of each source of waste may seem relatively minor, their potential cumulative effect on the environment can be significant.
- Waste production needs to be measured and managed. Laboratories should manage their wastes in the following ways:
  - Reduce its quantity
  - Reuse or redistribute of unwanted, surplus materials
  - Treat and/or recycle materials within the waste
  - Dispose through incineration, treatment, or land burial

Waste Categories and their Management

- Clinical laboratory wastes can be classified in several ways:
  - **Non- biological solids:** plastics, packaging, e-wastes (electrical and electronic wastes) and miscellaneous solid wastes including paper.
  - **Biological wastes**
  - **Chemicals:** liquid, organics, disinfectants, solvents, detergents used for laboratory purposes.

Management of Non-Biological Solids

Plastics

Globally, in 2019 the production and incineration of plastics pumped more than 850 million tonnes of greenhouse gases into the atmosphere.

Single-use plastics account for 40% of the plastics produced every year. Many of these products, may persist in the environment for hundreds of years. The biomedical sciences are particularly high-volume consumers of especially single-use plastics.

Microplastics i.e., tiny plastic particles, come from many sources and are ubiquitous. They enter into human beings via food and water, as well as breathing them in. Microplastics have been shown to harm wildlife and damage human and animals.

Plastics

10 ways to reduce plastics in laboratories

Can your packaging be sent back?
Several suppliers offer this so it can be reused. Engage your suppliers on what options they can offer.

Glass vs. Plastics: Could you switch from plastic to reusable glass?
The energy used for washing is far less than that to remake and transport plastic.

Do you require gloves?
Much research was successfully done without gloves in the past. Choose the appropriate gloves for your task – a thinner version may be just as safe.

a. Can you reuse gloves between experiments?
b. Thicker gloves are easier to reuse but have more plastic. Consider the balance between thickness and reuse that is best for your work.

Could your leftover plastic containers be used for something else in the lab?

Purchase 'flexible' kits:
Many labs use kits for standard processes – purchase kits which allow you to buy the contents separately – avoiding waste bottles/reagents.

Can you recycle your packaging?
Most packaging doesn't require incineration. Consider if there are ways to avoid excess clinical waste, e.g. targeting a few items which aren't contaminated to no longer go through clinical waste.

Create reagents/kits in-house:
Many common reagents and materials may be produced on site e.g. pour your own gels for DNA electrophoresis

Could you buy bulk?
Combine and share with other labs. Only do so when certain to utilise all contents.

Can you downsize your plastics?
Sometimes there are alternatives which perform the same task with less plastic. E.g. smaller tube sizes.

Tip boxes: Can you reload tip boxes?
Non-contaminated tip boxes can be recycled or some suppliers offer take-back schemes.

Reduction of Plastics

- Labs can reduce their consumption of plastics by choosing substitutes for plastics. A return to glass might be an answer.
- Select renewable and biodegradable alternatives to current plastics.
- Reduced use of plastics can also be achieved at the time of tendering for equipment and reagents. Choose IVD companies that:
  - Produce equipment with reduced plastic content.
  - Choose products with reduced packaging and/or environmentally friendly packaging.
  - Take back shells of used equipment.
  - Allow for reusable plastic accessories.
  - Take back packaging and used plastic reagent containers.

Reuse of Plastics

- Labs should reuse as many items as possible. Re-usable items can have comparable performance to single-use items.
- Consider the following items for reuse: pipette tip boxes, pipettes and pipette tips when aliquoting, weight boats, gloves (decontaminate with ethanol), tubes and cuvettes (with a rinse between) beaker or tip-collecting container.
- Labs should substitute disposable plasticwares even in sterile procedures e.g., glass tissue culture dishes instead of disposable, plastic dishes.

Recycling of Plastics

Plastics that can most commonly be recycled are **polystyrene (PS), polypropylene (PP**) and **high-density or low-density polyethylene (HDPE/LDPE).** Commonly used consumables such as centrifuge tubes are made of PP, while culture dishes and flasks are usually made of PS. HDPE and LDPE are most commonly found in lids.

Recycling nonhazardous plastic waste is also becoming an option for labs. Not contaminated plastic waste can be recycled keeping in a **"decontamination station"** with a 24-hour soak in a high-level disinfectant, followed by a rinse for chemical decontamination.

Many waste haulers are starting to accept non-hazardous plastic waste from labs. Several vendors offer recycling programs for their products. (European recylers. **Polycarbin** (**https://polycarbin.com/**) have developed a circularity concept for laboratories to recycle plastics and it is important that diagnostic laboratories start to assess the feasibility of recycling plastics.

e-waste (Electrical and electronic wastes)

- It is estimated that 57.4 Mt (Million Metric Tonnes) of e-waste was generated globally in 2021. There is over **347 Mt** of unrecycled e-waste on earth in 2022.
- Europe has the highest collection and recycling rate is 42.5%.
- E-waste does not biodegrade and accumulate wherever it is dumped.
- Landfilling e-waste is harmful to the environment because of toxins such as mercury, lead, cadmium, nickel, beryllium and arsenic can leach into the soil and water course and become harmful to human and animal health.
- Medical equipment no longer in use, fluorescent tubes, batteries, phones, computers, etc. should be recycled or disposed in accordance with local regulations.
- Buy environmentally friendly electronics labeled **Energy Star** or certified by the **Electronic Product Environmental Assessment Tool (EPEAT).**

Paper use

- Buy chlorine free paper
- Recycle and reuse paper
- Reduce printing
- Encourage printing only where necessary

Biological Waste

- Laboratory biological waste may be defined as infectious or potentially infectious pathological waste. Biological waste includes:
  - Liquids: cell culturing media, supernatants, blood or blood fractions (serum), etc. which contain viable biological agents.
  - Any part of the human body, tissues and body fluids; hair, nail clippings.
  - Any part of an animal infected [or potentially infected] with a communicable disease.
  - Non-sharp, solid laboratory waste (empty plastic cell culture flasks and petri dishes, empty plastic tubes, gloves, wrappers, absorbent tissues, etc.) which may be, contaminated with viable biological agents.
  - All sharp and pointed items used in medical care, diagnosis, and research.
  - Laboratory glassware which is thought to be contaminated with hazardous biological agents.
  - Any material collected from a spill of infectious or chemotherapy waste.
  - Waste mixed with infectious waste that cannot be considered as chemical hazardous waste or radioactive waste.

Disposal Procedures- Liquid waste

- Biological liquid waste can be poured down the drain (sanitary sewer), under running water **after it has been decontaminated** by autoclave or chemical means. The sink should be rinsed well and disinfected after the disposal procedure.

- ***Steam autoclaving*** is considered to be the method of choice for decontaminating cultures, laboratory glassware, pipettes, syringes, or other small items contaminated with infectious agents. Autoclaved waste can be disposed of as general waste.

- ***Chemical decontamination:*** This may be achieved using **PRESEPT™,** a biocidal disinfectant containing NaDCC (Sodium dichloroisocyanurate, troclosene sodium). It provides protection against all organisms including Methicillin-resistant Staphylococcus aureus (MRSA), HIV, Hepatitis B and Herpes viruses. The denatured blood may be discarded into laboratory sink with plenty of water.

Chemical Strategy for Sustainability

Chemicals are essential components of our daily lives, for well-being, high living standards and comfort of modern society.

They are used in many sectors, including health. However, some chemicals have hazardous properties which can harm the environment and human & animal health.

There is an increase in health problems that can be partially explained by the use of chemicals. Some man-made chemicals are found in the most remote places in the environment, but also in our bodies. Chemicals are everywhere.

Clinical labs must choose safer, more sustainable alternatives to hazardous chemicals.

Comprehensive chemical legislations should be implemented in the clinical laboratories all around Europe.

Hazardous chemicals

Certain chemicals cause cancers, affect the immune, respiratory, endocrine, reproductive and cardiovascular systems, weaken human resilience and capacity to respond to vaccines and increase vulnerability to diseases. Exposure to these harmful chemicals is therefore a threat to human health.

Chemical pollution is one of the key drivers putting the Earth at risk, impacting and amplifying planetary crises such as **climate change, degradation of ecosystems and loss of biodiversity**.

New chemicals and materials must be inherently safe and sustainable, from production to end of life, while new production processes and technologies must be deployed to allow the **chemical industry's transition to climate neutrality.**

Hazardous chemicals

- They can cause stratospheric ozone depletion and affect ecosystems, flora and fauna, decrease water and air quality, contaminate land and affect insect pollinators, especially if used and/or discarded with disregard for current legal, scientific and technical guidelines.
- Chemical pollution contributes to the climate change and loss of biodiversity.
- In the healthcare sector, disposal of untreated waste can promote the contamination of drinking water, groundwater, and surface water if landfills are not adequately built; inappropriate waste incineration can result in air pollution and ash residue, generation of carcinogenic dioxins and furans from chlorine-containing substances and spread of toxic metals from lead, mercury and cadmium-containing materials.
- Recent data points to over 2.5 million contaminated sites in Europe, in need of damage control measures. Therefore, **new production processes and technologies, as well as new chemicals, must be sustainable throughout the product life cycle**.

combination effects of chemicals

Different hazardous chemicals in human tissues and blood can induce toxic combination effects that are greater than the effects of each individual chemical separately.

Combination effects of chemicals have gained relevance, which consist of exposure at low concentrations of different hazardous chemicals, even if all substances are below the **Predicted No-Effect Concentration (PNEC)**.

SUSTAINABLE-GREEN CHEMISTRY

Design of chemical products and processes that minimize or eliminate the use or generation of substances hazardous to humans, animals, plants, and the environment.

Green chemistry is applied throughout its life cycle, including the design, production, use and final disposal of a chemical product.

Green chemistry is also known as sustainable chemistry. Green chemistry should be used to sustain quality life on earth.

Although the chemical industry has very positive contributions, they also cause pollution problems. Green Chemistry ensures that chemistry is made in a way that does not harm the environment or human health.

Chemicals strategy

The EU's chemicals strategy for sustainability towards a toxic-free environment

Chemicals are essential for the well-being, high living standards and comfort of modern society. They are used in many sectors, including health, energy, mobility and housing.

However, most chemicals have hazardous properties which can harm the environment and human health.

The EU already has sophisticated chemicals laws in place, but global chemicals production is expected to double by 2030. The already widespread use of chemicals will also increase, including in consumer products.

The European Commission published a chemicals strategy for sustainability on 14 October 2020. It is part of the EU's zero pollution ambition, which is a key commitment of the European Green Deal.

https://ec.europa.eu/environment/strategy/chemicals-strategy_en

Key actions in the Chemicals Strategy

- **Banning the most harmful chemicals** in consumer products - allowing their use only where essential
- **Account for the cocktail effect of chemicals** when assessing risks from chemicals
- **Phase out per - and polyfluoroalkyl substances (PFAS)** in the EU, unless their use is essential
- **Boost the investment and innovative capacity** for production and use of chemicals that are **safe and sustainable by design** throughout their life cycle
- **Promote EU's resilience of supply** and sustainability **of critical chemicals**
- Establish a simpler "**one substance one assessment**" **process** for the risk and hazard assessment of chemicals
- **Play a leading role globally** by championing and promoting high standards and not exporting chemicals banned in the EU

https://ec.europa.eu/environment/chemicals/index_en.htm

LEGISLATIONS

Chemicals-related legislations have more than 100 directives and regulations. This section pertains only to the most important documents.
United Nations (UN) Sustainability Development Goals
World Summit on Sustainable Development (WSSD): achieve the environmentally sound management of chemicals and all wastes throughout their life cycle.
European Green Deal (EGD)
European List of Wastes (LoW)
EU Waste Framework Directive
Basel convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.
Globally Harmonized System of Classification and Labelling of Chemicals (GHS), formally adopted in July 2003 by the United Nations Economic and Social Committee.
EU Regulation on the registration, evaluation, authorization and restriction of chemicals (REACH)
•Regulation on the Classification, Labelling and Packaging of hazardous substances (CLP)
UN Environment Program on Mercury
International Organization for Standardization (ISO):
-ISO 14000
-ISO 14001:2015
-ISO 9000
-ISO 15189
-ISO 19011
Environmental, health and safety guidelines (EHS) from the International Finance Corporation (IFC) on occupational health and safety.
Other EU documents

EU LEGISLATIONS

The existing EU legal framework on chemicals, in particular the Regulation on the **Classification, Labelling and Packaging (CLP) of hazardous substances** and the EU Regulation on the **registration, evaluation, authorization and restriction of chemicals (REACH)** are the **strictest legislation** in the world, regulating chemical substances, affecting industries throughout the world.

The Chemicals Strategy suggests that they should be reinforced with targeted revisions of both Regulations to ensure that there is sufficient information on chemicals manufactured or imported into the EU.

EU LEGISLATIONS

Implementation and enforcement of European chemicals legislation is needed to ensure compliance for the whole life cycle of chemicals: **production, placing on the market, release, and disposal.**

Currently almost 30% of the alerts on dangerous products on the market involve risks due to chemicals.

Only one third of the registration dossiers of the chemical substances registered by industry under REACH are fully compliant with the requirements.

Zero-tolerance approach to non-compliance

Enforcement and compliance of EU chemicals legislations to ensure the highest level of protection of health and environment from hazardous chemicals.

Essential uses

The Commission is defining criteria for essential uses.

This will ensure that the most harmful chemicals are only allowed if their use is necessary, or if their use is critical for the functioning of society and if there are no acceptable alternatives.

These criteria will guide the application of the concept of essential uses in all relevant EU legislation for both generic and specific risk assessments.

All relevant stakeholders will be consulted on the development of the concept and the policy options in Spring 2022.

The Commission plans to present the criteria on essential uses of chemicals by the end of 2022 and introduce the concept in the proposal for the **REACH revision.**

EUROPEAN FEDERATION OF CLINICAL CHEMISTRY AND LABORATORY MEDICINE

Green Labs

Suggestions for Clinical Laboratories

SAFER CHEMICAL SUBSTITUTIONS SHOULD BE IMPLEMENTED. USING HAZARDOUS CHEMICALS SHOULD BE AVOIDED WHENEVER POSSIBLE.

CHEMICAL INVENTORY MUST BE MANDATORY FOR ALL LABS TO KNOW THE SUPPLIES NOT TO OVER ORDER.

CHEMICALS SHOULD BE DATED WHEN OPENED AND USED ON A FIRST-IN, FIRST OUT-BASIS TO KEEP SUPPLIES FRESH.

Suggestions for Clinical Laboratories

Selection of solvents should be based on criteria of

(i) Worker Safety

(ii) Process Safety

(iii) Environmental and Regulatory Considerations

(iv) solvents should be classified in three categories as: **preferred, usable and undesirable.**

.

Reduce and Recycle Solvents:

Reduce the use of organic solvents by recycling them, which reduces exposure and chemical waste – many solvents (**acetone, acetonitrile, xylene, alcohol, formalin**) can be efficiently distilled back to +99% purity through on-site recyclers and vendors:

- Xylene, alcohol and formalin may be recycled by the use of a CBG Biotech Supreme Solvent Recycler (Thermo-Fisher Scientific).

Small volumes need to be purchased intermittently to replace the dead volume lost during the recycling process, which is also economically favourable.

Greener Alternative Products

The **Merck Sigma Aldrich** company has 4 Categories of **Greener Alternative Products** fulfilling one of the four criteria below:

1. Re-engineered Products to improve their **environmental footprint**.

2. Products align with the **12 Principles of Green Chemistry.**

3. Enabling Products helps to make **greener alternatives** possible through enabling technologies.

4. **Design for Sustainability (DfS)** Developed Products demonstrate significant sustainability characteristics.

DOZN™ **Quantitative Green Chemistry Evaluator tool** of Merck Sigma Aldrich is a quantitative, industry-first tool that uses the 12 principles of green chemistry for **comparing the relative greenness of similar chemicals, synthetic routes, and chemical processes.**

(https://www.sigmaaldrich.com/TR/en/services/software-and-digital-platforms/dozn-tool).

https://www.sigmaaldrich.com/TR/en/technical-documents/technical-article/analytical-chemistry/green-chemistry-principles

Procurement

Healthcare represents approximately half of the EU government expenditure, with more than 15 000 hospitals.

Clinical laboratories should shift towards green alternatives by adopting a green purchasing policy, which includes the selection and acquisition of products that minimize environmental impacts over their entire life-cycle:

- use recyclable
- recycled
- less toxic
- locally produced chemicals whenever possible.

Chemical waste management

- In cases where exclusion of hazardous chemicals cannot be done, it is key to have dedicated management and safe and efficient separation of waste.

- Chemical waste disposal must be as safe as possible. Label, store and dispose of hazardous chemicals according to procedures and considering specialized clinical laboratory waste; preferably, write **Standard Operating Procedures (SOPs)** for handling chemical waste/hazardous chemicals.

EUROPEAN FEDERATION OF CLINICAL CHEMISTRY AND LABORATORY MEDICINE

Green Labs

Rational number of tests

Laboratory testing costs constitute approximately 3% of all clinical costs. Unnecessary tests should be avoided to reduce healthcare expenditure and laboratory budgets. One of the ways wastes can be minimised is by ensuring that only tests that are necessary are performed. It also makes good economic sense.

Auditing requests of laboratory tests to identify test redundancy can decrease the number of reagents and hazardous chemicals used. Reduction of blood tubes collected from each patient, reduces material costs, decreased water usage and waste.

World Health Organization **(WHO)** published an **Essential in Vitro Diagnostics (IVD) List,** which identified **35 test categories** of general IVDs that can be used for the diagnosis of several **common diseases** and **27 test categories** of IVDs for the management of **HIV infection, tuberculosis, malaria, hepatitis B and C, syphilis and HPV infection**.

Making the laboratory SUSTAINABLE and GREEN may not be an immediate action.

- To ensure the involvement of all laboratory personnel
- To increase environmental awareness
- To be aware of UN and EC sustainable development goals
- Precautions has to be taken to reduce environmental pollution
- The important thing is to make the decision and start from somewhere.


Q&A