Sustainability in pharmacy – actions for the environment

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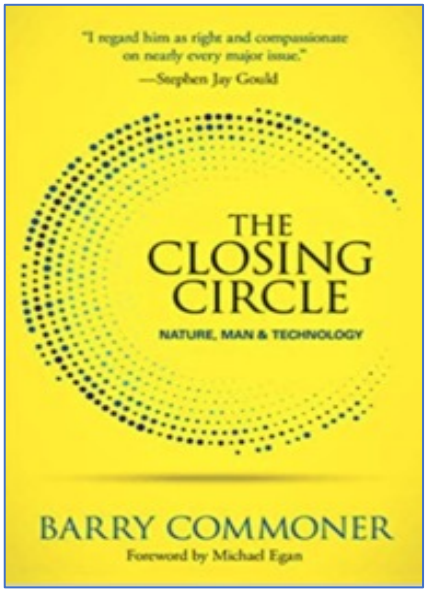
School of Pharmacy, RCSI & Irish Doctors for the Environment
25th September 2024

Overview

- Planetary health & its importance to human health
- Disruptions and disruptors of planetary health integrity
- Why climate crisis is a health crisis
- The contribution of healthcare and medicines use
- *How pharmacy can (& probably should) play a role in sustainable healthcare*

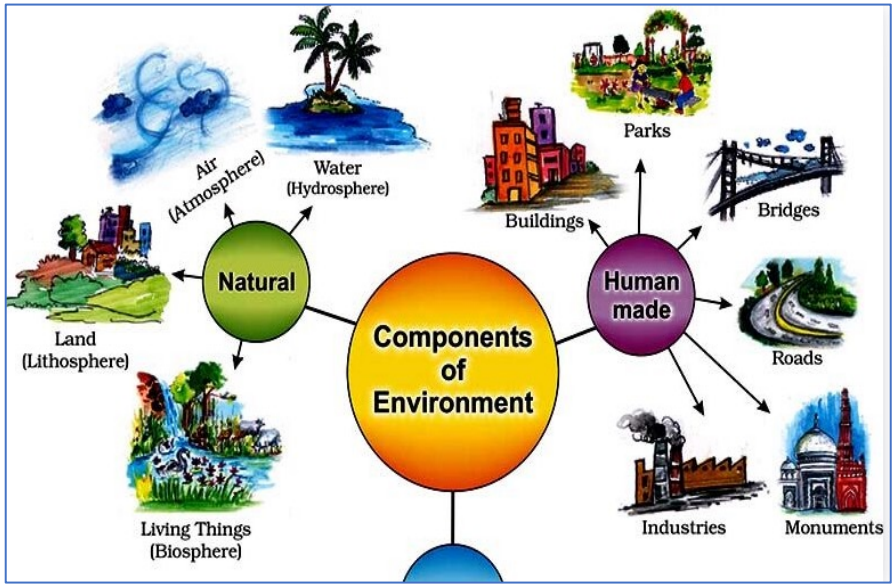
Planetary health

- The health of human civilisation & the state of the natural systems on which it depends *(H. Frumkin)*



- Four Laws of Ecology
  - Everything is connected to everything else
  - Everything must go somewhere
  - Nature knows best
  - There is no such thing as a free lunch

- Damage to the planet's natural (life support) systems undermines & reverses progress on human health



Earth's spheres

The biosphere and its essential diversity.

Fig. 1 Interlinks between 17 SDGs and the 5P principles: people, prosperity, plant, peace and partnership. Source: Modified from SDG Services [7]

So what is happening….and why?

- A new ‘sphere’ has impinged on the planet

Anthrosphere – the human component of earth system

Anthropocene era - consumption

Evidence

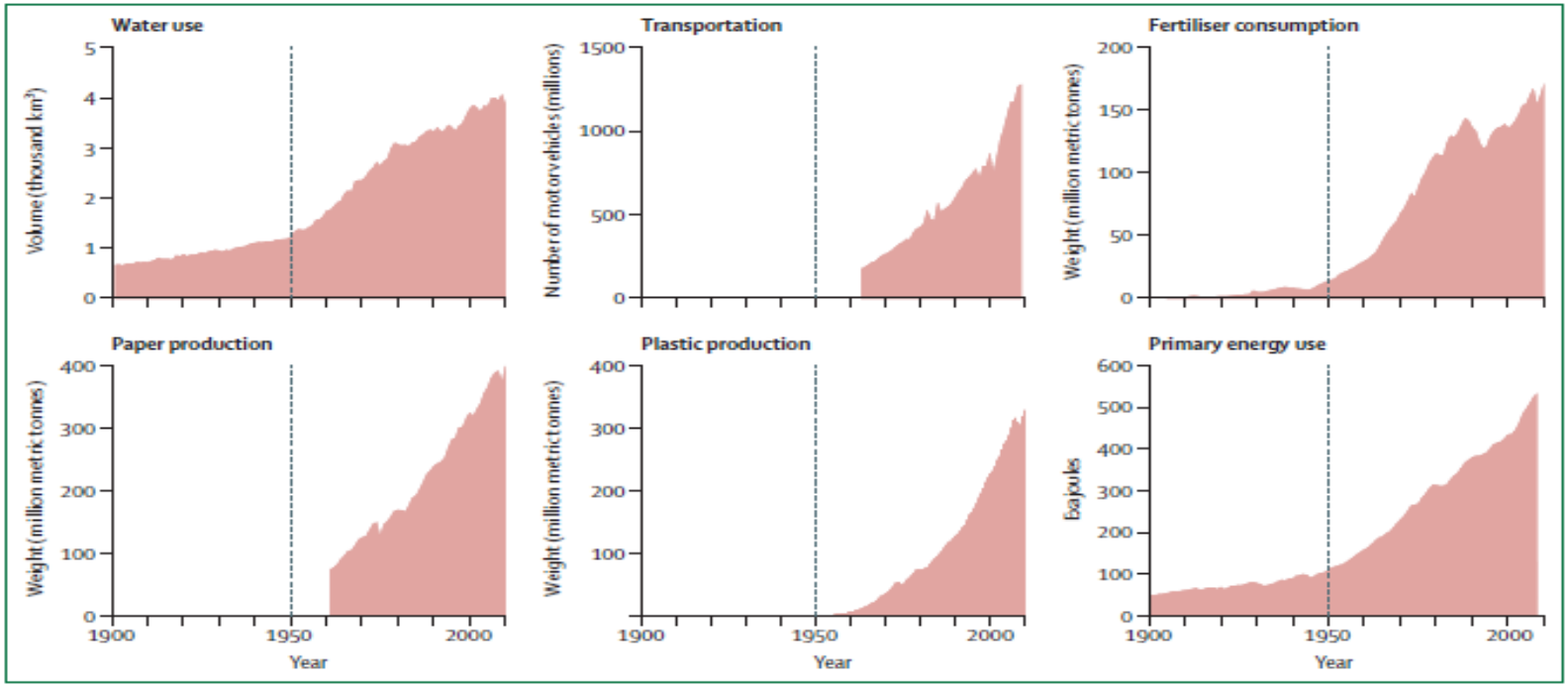


Figure 2: Measures of consumption over time

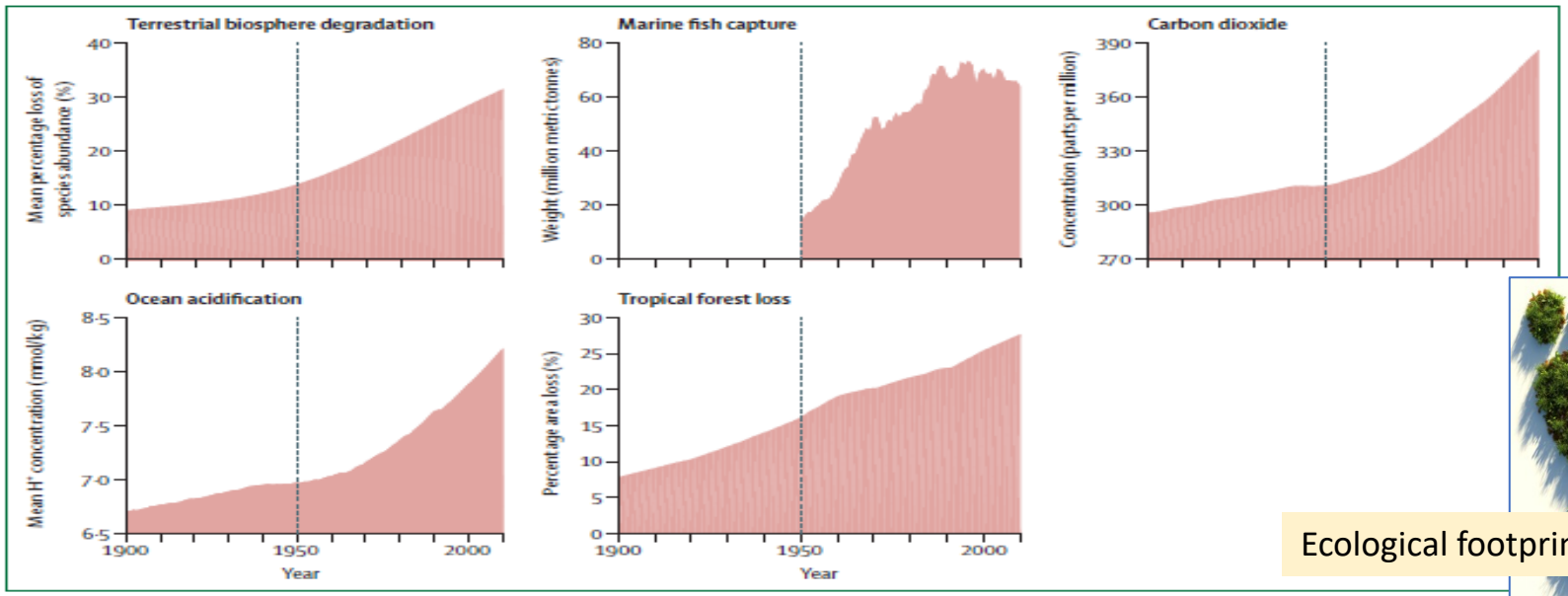
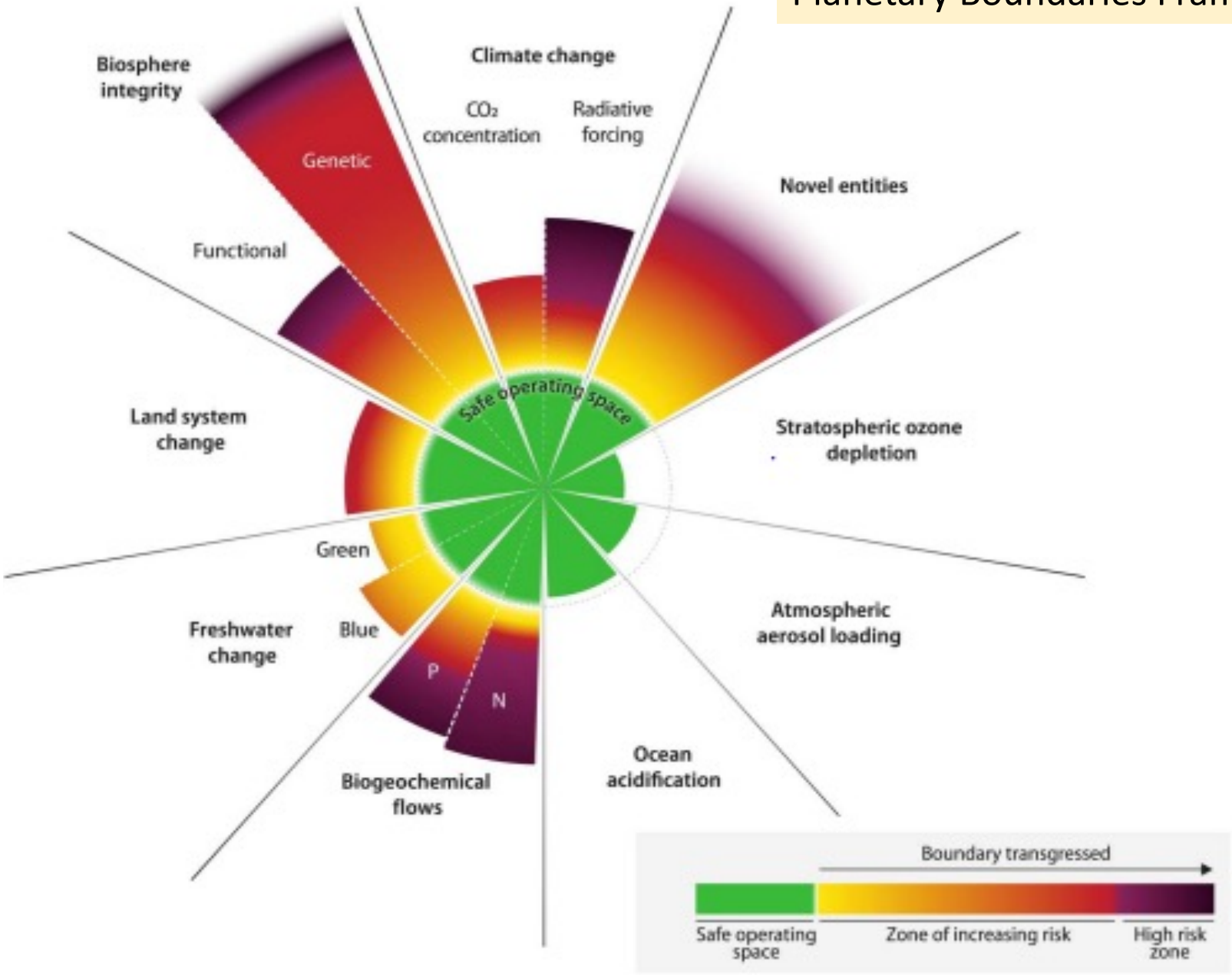


Figure 3: Measures of human impact on natural systems

Ecological footprint

Myers S. 2017 - dx.doi.org/10.1016/S01406736(17)32846-5

Planetary Boundaries Framework



doi: 10.1126/sciadv.adh2458 (Richardson *et al* 2023)

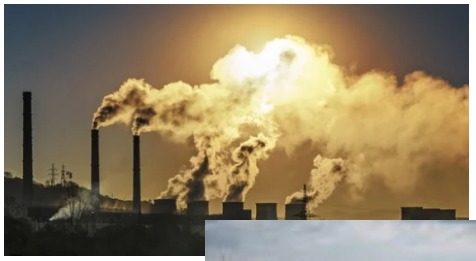
Planetary boundary transgressions

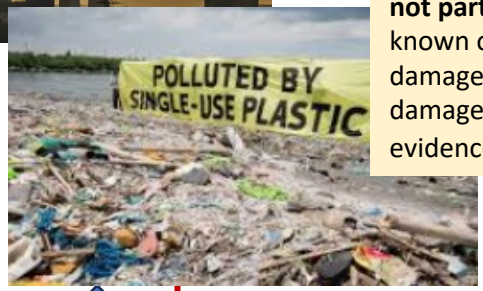
1. Biodiversity loss

2. Biogeochemical flows – N & P

True-colour satellite image from 4 September 2023 showing algal bloom conditions on Lough Neagh in Northern Ireland. Source: Copernicus.

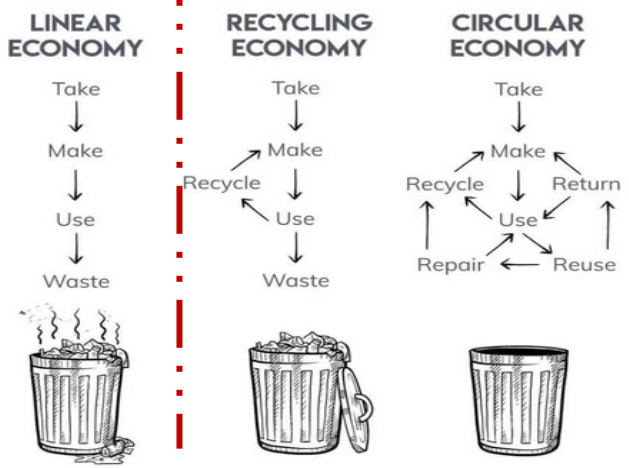
3. Novel entities



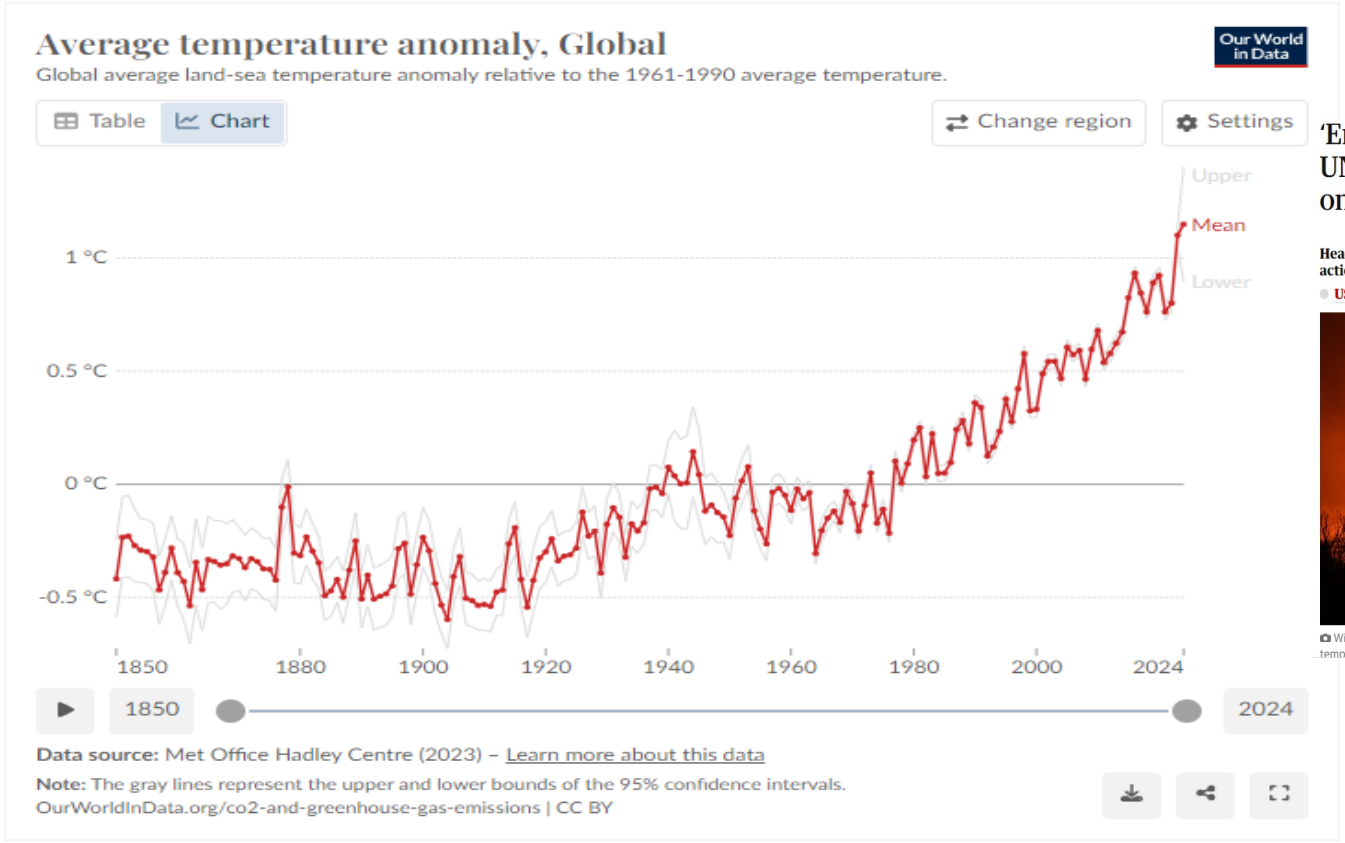


Man made plastic & other chemicals as **novel entities are not part of nature**… little known of their environmental damage, or indeed potential damage to human health, but evidence emerging

Waste



4. Planetary boundary of climate change



'Era of global boiling has arrived,' says UN chief as July set to be hottest month on record

Head of World Meteorological Organization also warns 'climate action is not a luxury but a must' as temperatures soar

US climate blog - latest updates

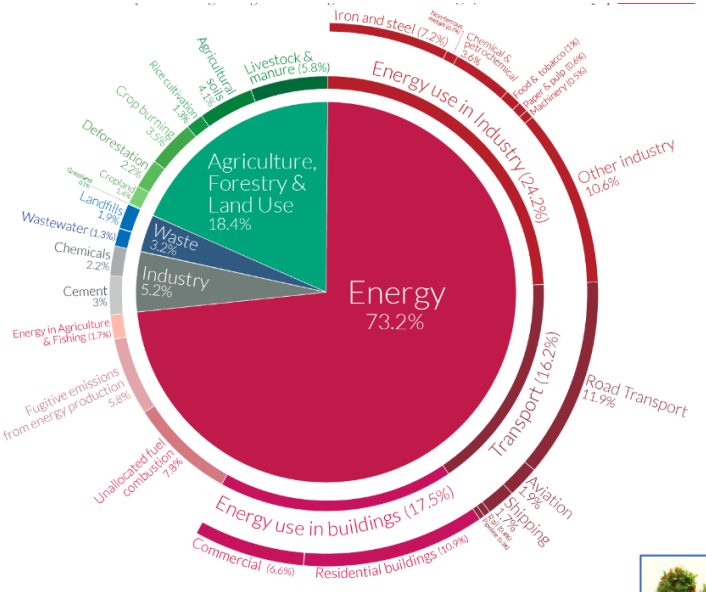
Wildfires rage in the Kınık district of İzmir, Turkey. The steady rise in global average temperatures has made weather extremes worse. Photograph: Anadolu Agency/Getty Images

Driven by greenhouse gas emissions

https://ourworldindata.org/co2-and-greenhouse-gas-emissions

Global warming potentials of GHGs & sources

Greenhouse gas	GWPs in 100 years
Carbon dioxide	1
Methane	28
Nitrous oxide	265
Perfluoromethane (tetrafluoromethane)	6,630
Perfluoroethane (hexafluoroethane)	11,100
Sulphur hexafluoride	23,500
Hydrofluorocarbons(HFCs)	dependent on HFC type

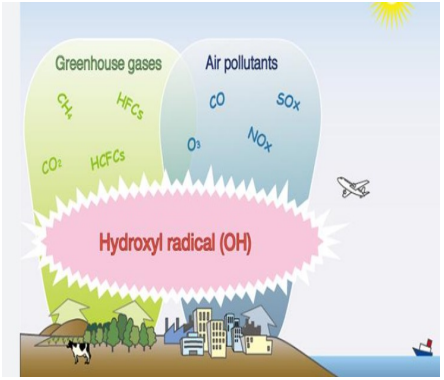


Carbon footprint

Carbon sinks and removal of GHGs

- Earth's sinks
  - Forests
  - Oceans
  - Soil

- Atmospheric removal – hydroxyl radical
  - Levels so high, atmospheric hydroxyl radical overwhelmed by levels of GHGs
  - O_3 + UV light $\longrightarrow$ O_2 + O
  - O + H_2O $\longrightarrow$ 2OH



Montreal Agreement of 1987 involve – banned CFCs

Why? - Health impacts of climate change

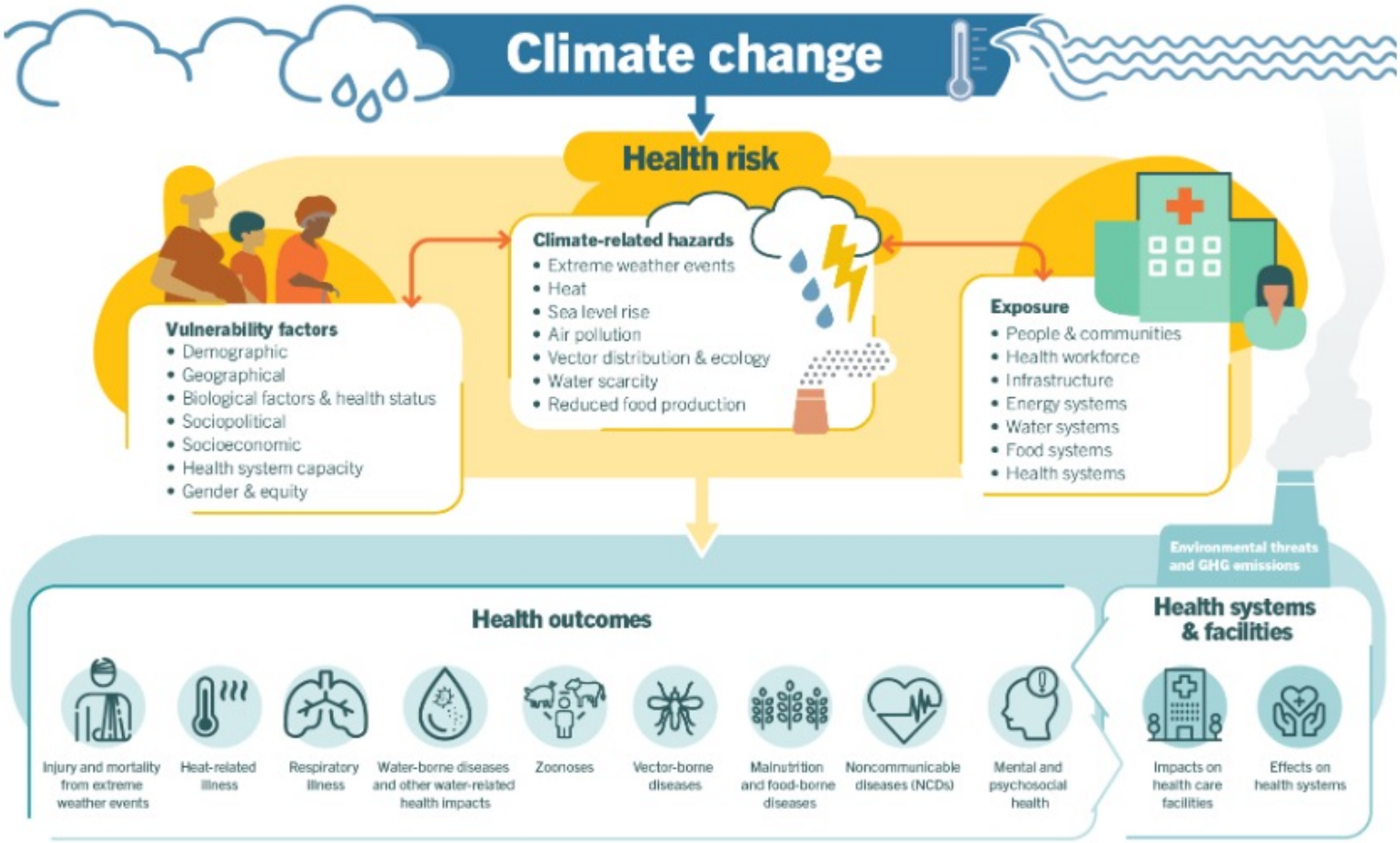
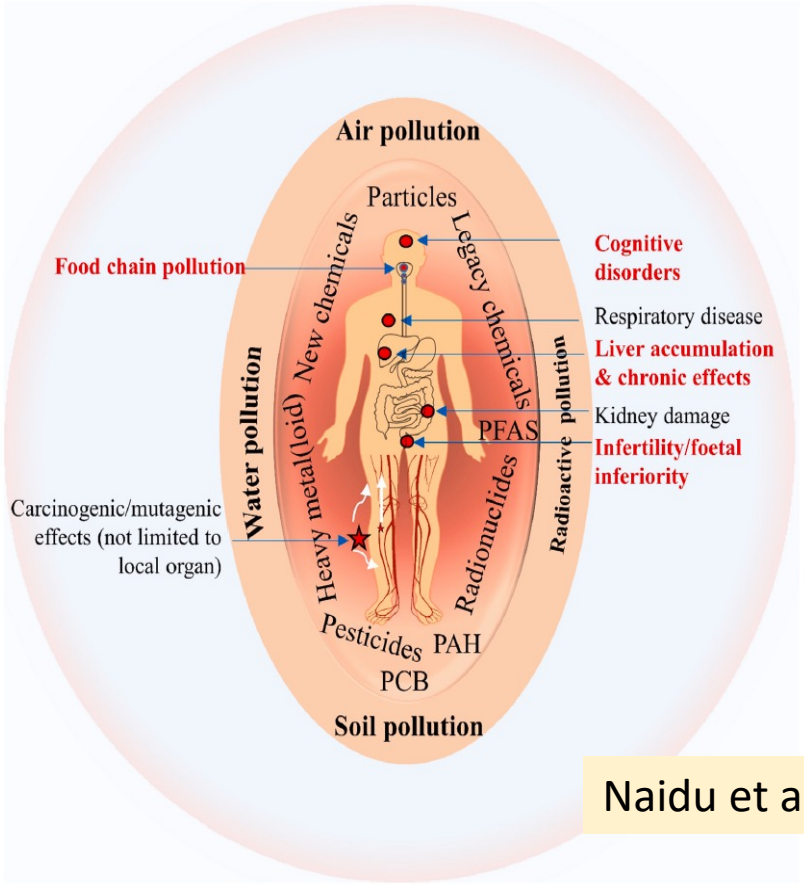


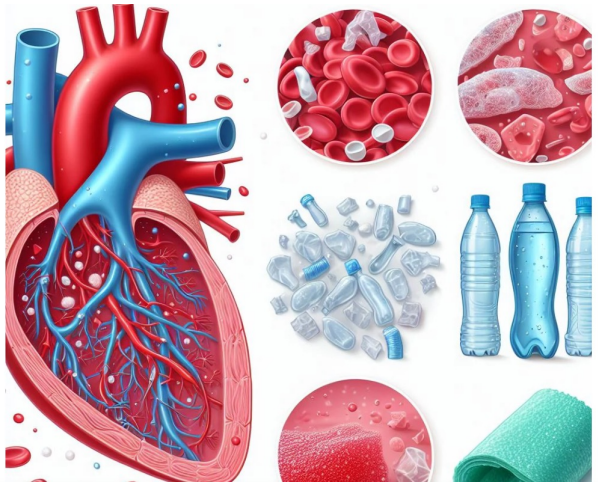
Figure: An overview of climate-sensitive health risks, their exposure pathways and vulnerability factors. Climate change impacts health both directly and indirectly, and is strongly mediated by environmental, social and public health determinants.

https://www.youtube.com/watch?v=9ssNM-Hlks4&ab_channel=DWNews

Why? - Health effects of ‘novel entities’



Naidu et al

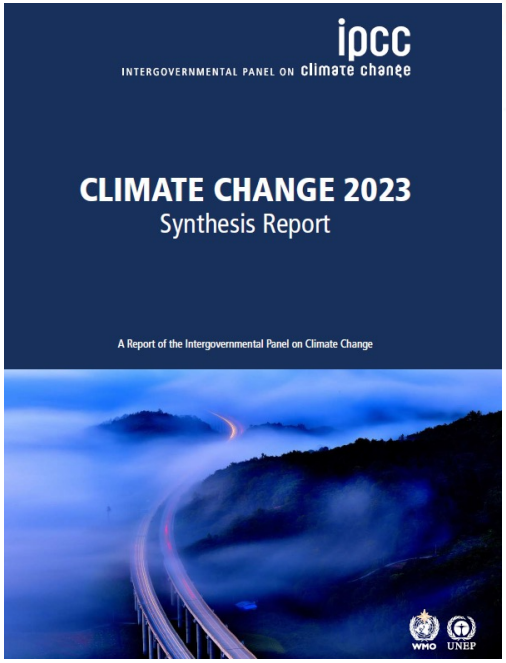


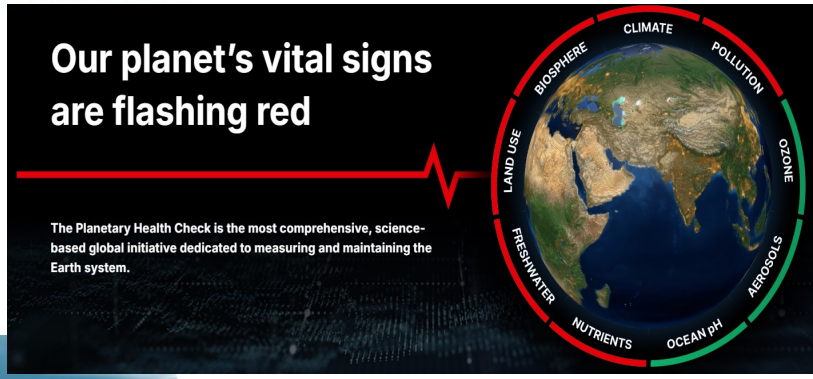
CONCLUSIONS

In this study, patients with carotid artery plaque in which MNPs were detected had a higher risk of a composite of myocardial infarction, stroke, or death from any cause at 34 months of follow-up than those in whom MNPs were not detected. (Funded by Programmi di Ricerca Scientifica di Rilevante Interesse Nazionale and others; ClinicalTrials.gov number, NCT05900947.)

Microplastics & the heart – NEJM 2024

How might pharmacists and pharmacy be affected by the whys outlined?

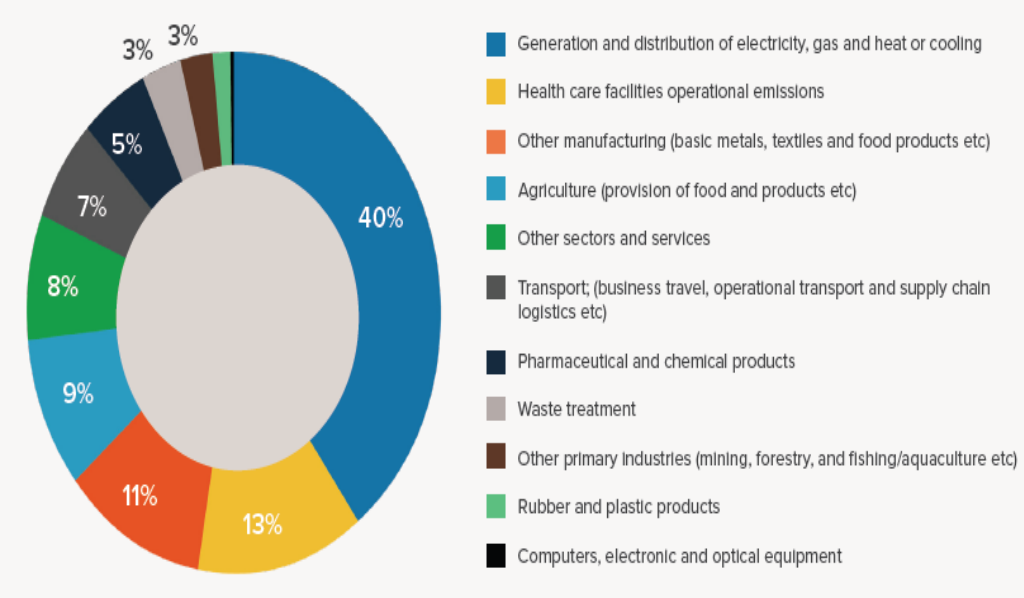




Requires mitigation and adaptation strategies

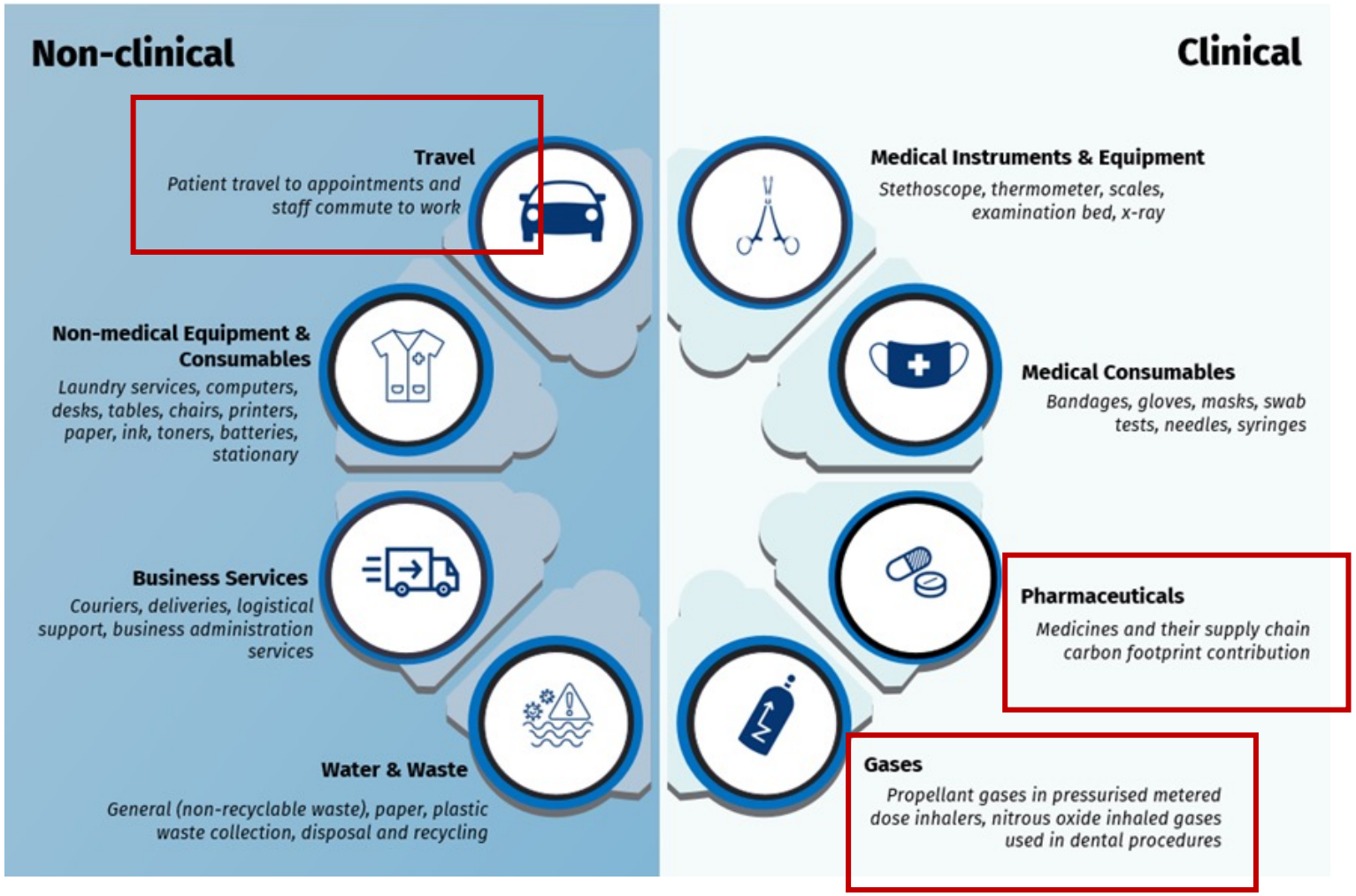
Impact of healthcare delivery

- Increased use of healthcare services (consumption)
- In & of itself it pollutes and harms and therefore impacts human health
- High carbon footprint and direct environmental damage



Waste from one ICU bed in one day
(Erasmus MC)

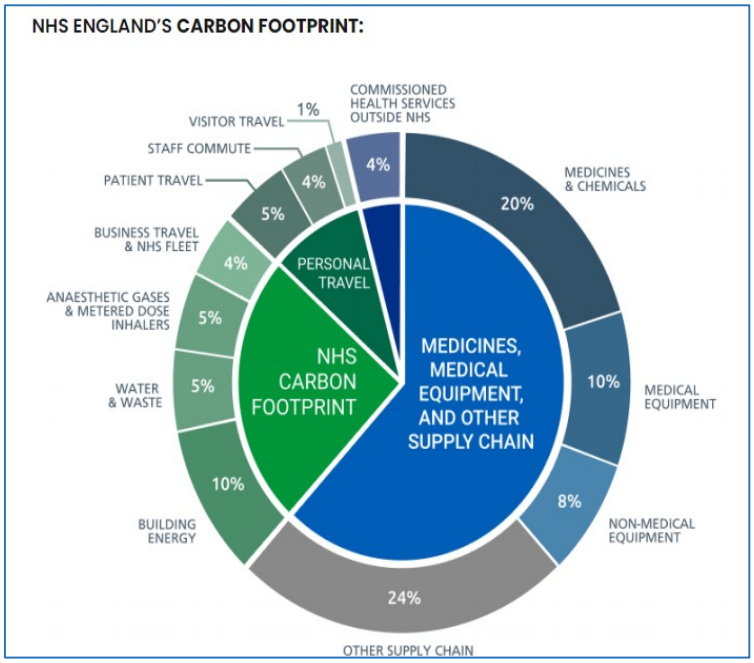
Outcomes from a scoping review in primary care August 2024



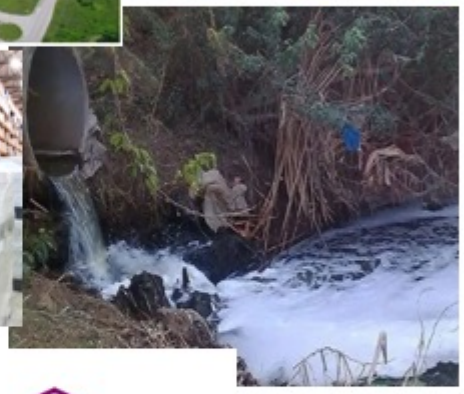
Walsh *et al* August 2024

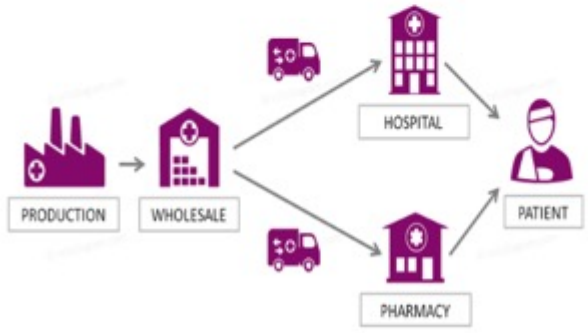
Impact of medicines

- Medication use/consumption high and rising across all age groups – polypharmacy*
- 25% entire **Carbon footprint** of healthcare systems
- Responsible for considerable environmental harm (novel entities)
- Associated with significant waste

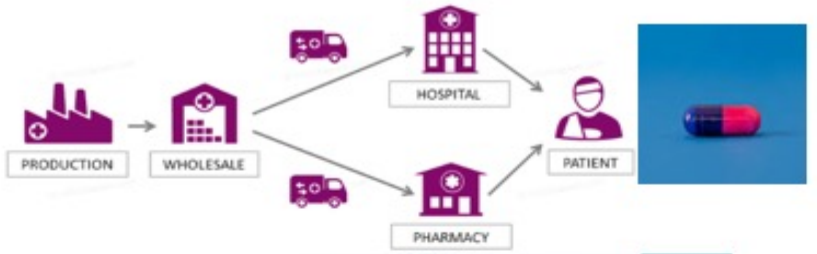


Upstream sources





Downstream – use phase



Overprescribing among Older People: TILDA Study

RESEARCHERS FROM THE IRISH LONGITUDINAL STUDY ON AGEING (TILDA) HAVE RECENTLY PUBLISHED A STUDY WHIC LOOKED AT OVERPRESCRIBING AMONG OLDER PEOPLE NEAR END OF LIFE IN IRELAND

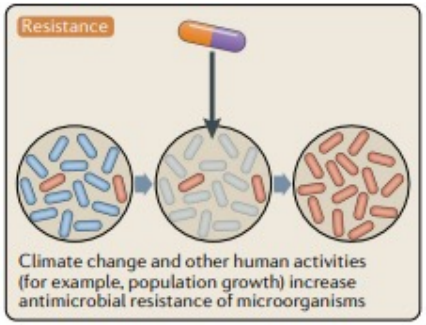
Medicines prescribed and not taken have incurred a C footprint from its manufacture, storage, distribution etc.

Used and disposed medicines

- APIs & metabolites end up in our waterways
  - Potential for ecological & human contamination

- OCP, metformin, NSAIDs, statins, antidepressants, antibiotics, paracetamol etc. etc.

- Long-term impact of sub-therapeutic exposure unknown
  - Ecotoxicology testing? Ecopharmacovigilance?



- Inability of wastewater systems to eliminate residues

Ref. Sharon Pfleger, HPAI April 2024

A green lens on healthcare – global, EU, local

World Health Organization

UNFCCC

United Nations Climate Change COP 29

November 2024

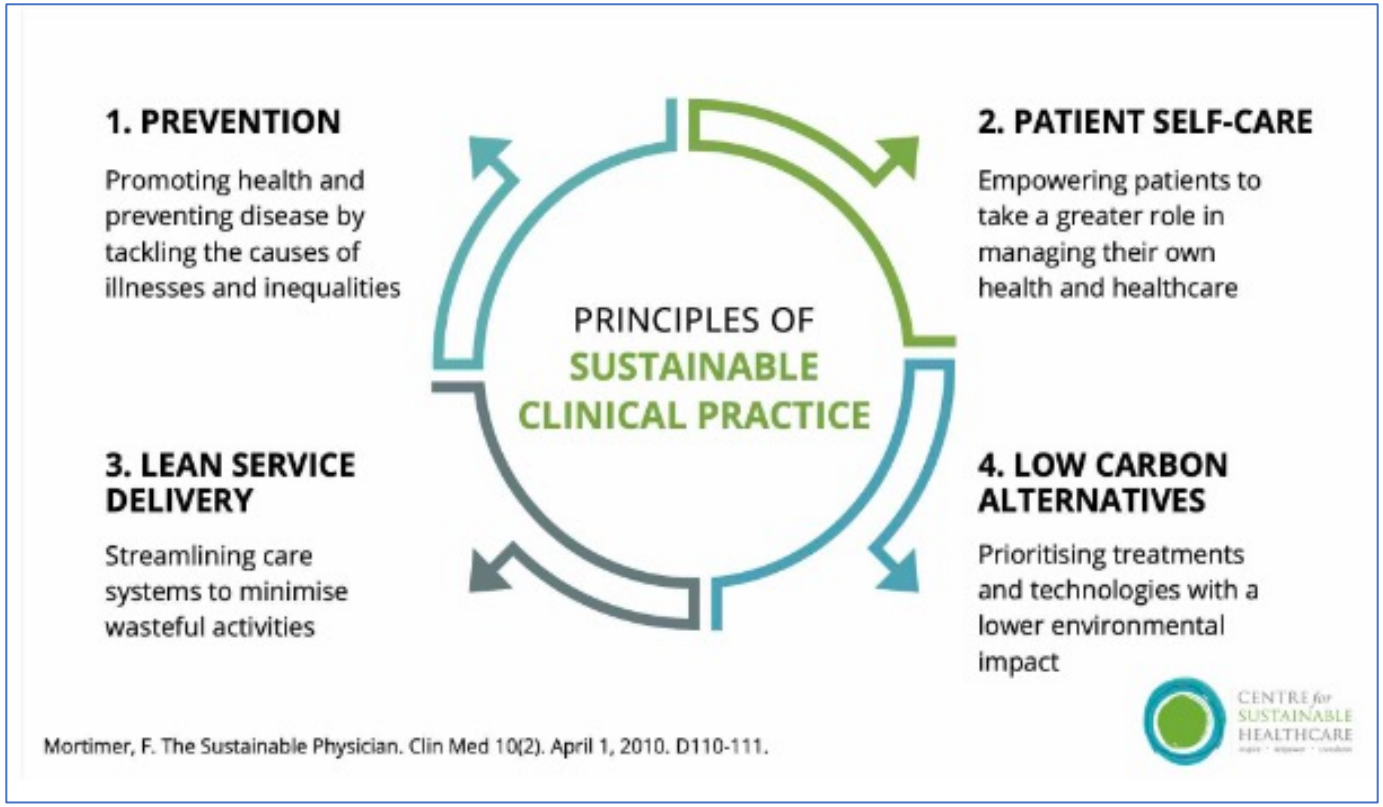
Health Care Without Harm

CENTRE for SUSTAINABLE HEALTHCARE

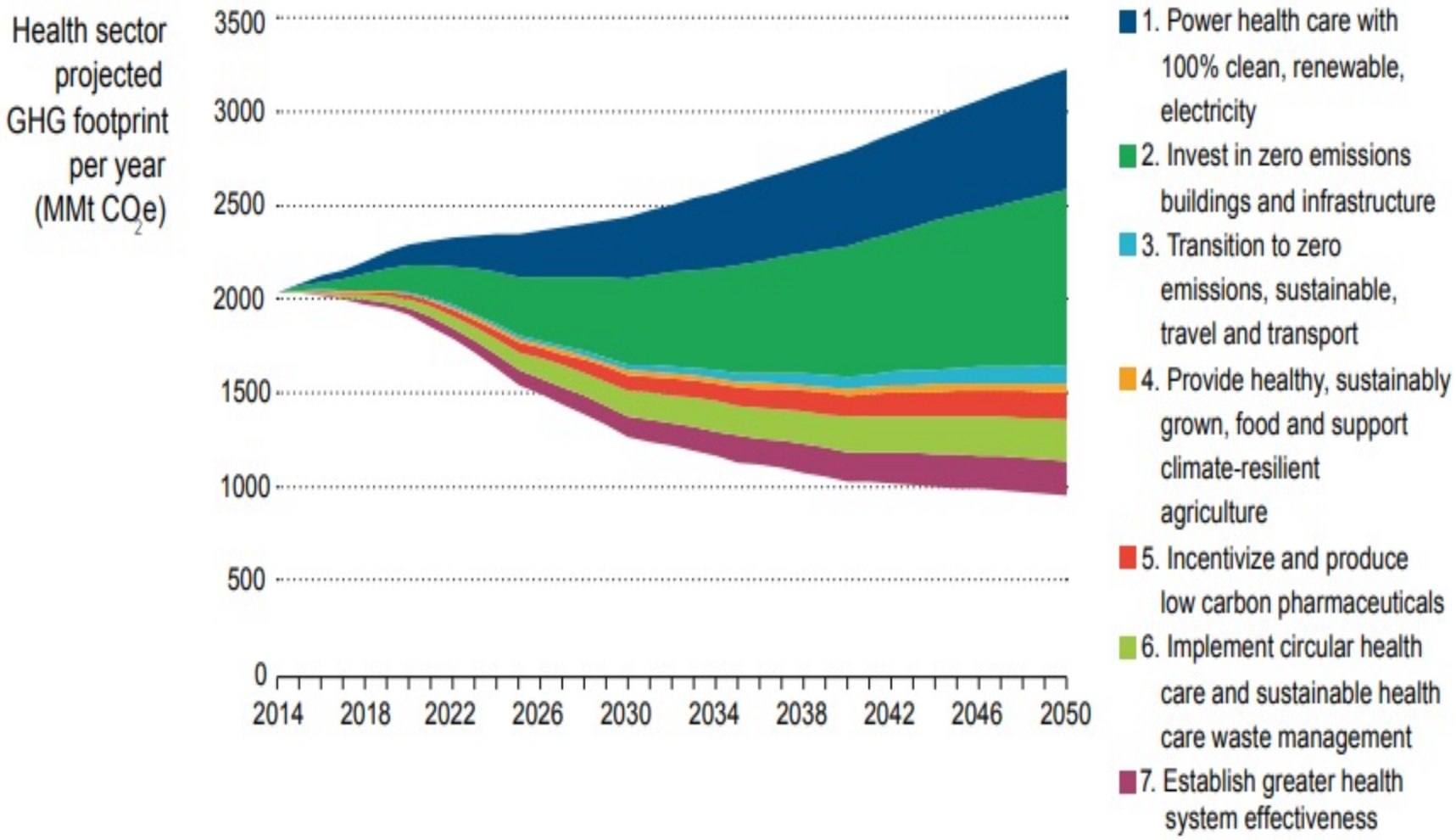
inspire • empower • transform

Four principles of sustainable healthcare
(F. Mortimer 2010, & Centre for Sustainable Healthcare)

'The ability to provide healthcare to meet the needs of this generation without compromising the ability of future generations to meet their healthcare needs'

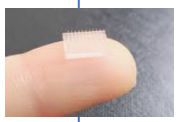


HCWH Report 2021 – mitigation strategies



Medicines life cycle interventions - upstream

Design → Marketing authorisation → Production & packaging → Post-authorisation

Design	Marketing authorisation	Production & packaging	Post-authorisation
Green Chemistry Principles  Novel eco friendly products & formulations  EPV	Strengthen environmental risk assessments e.g. PBT Additional risk identification	Assess supply chain Green packaging Minimise pollution risk	Eco-pharmacovigilance HTA – environmental impact

Can we impact on upstream effect?

Environmental and Social Governance (ESG reporting)

Medicines life cycle interventions - downstream

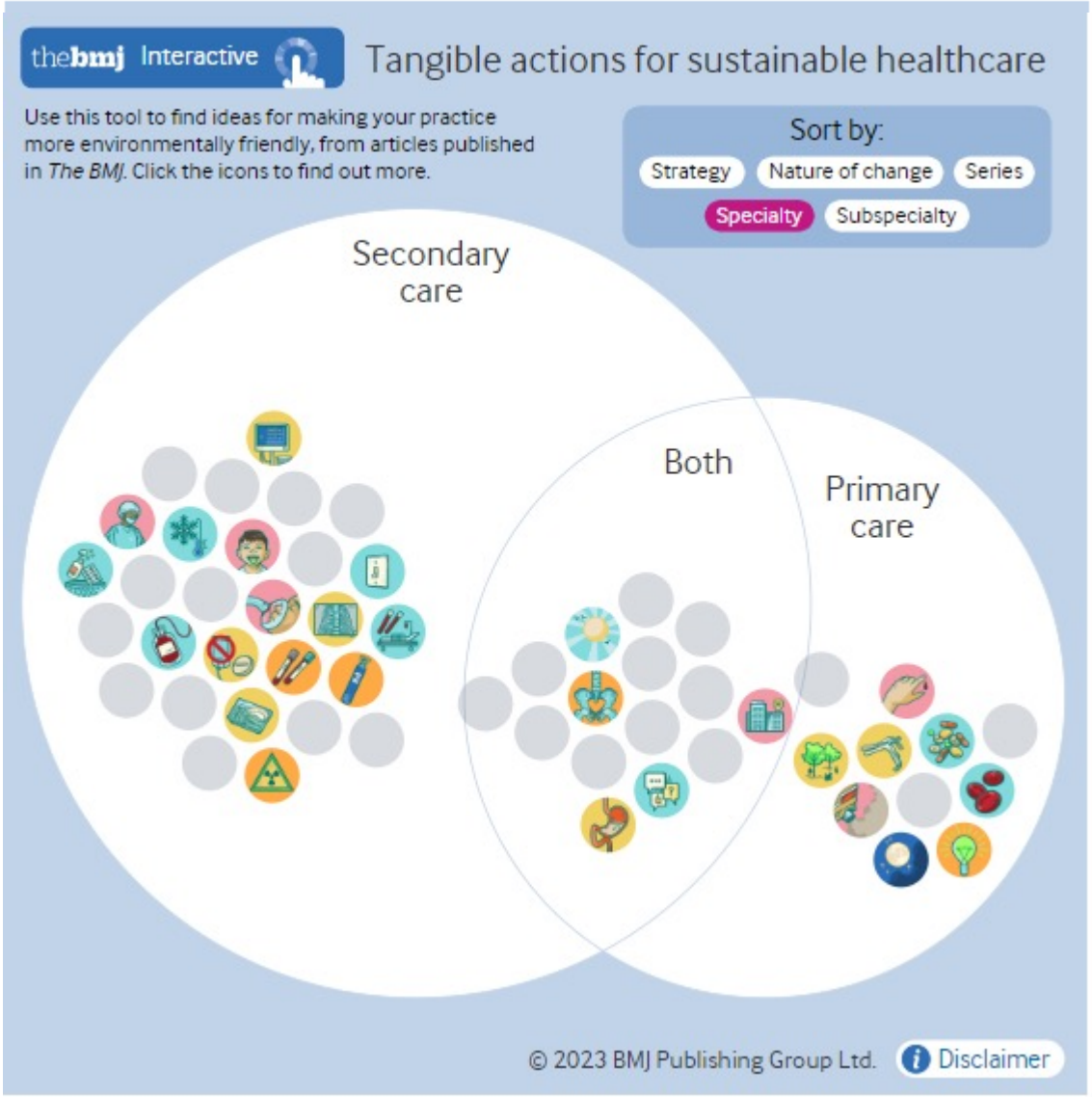
Procurement	Prescribing	Dispensing	Use	Disposal
Green procurement Medicines env & C footprint? D & T Committees – C & E footprint	Eco-directed prescribing Non-pharmacologic interventions Reduce overuse	Eco-informed use of medicines Deprescribing, meds optimisation Avoid & reduce waste	Optimise use Ensure compliance Avoid & reduce waste	Minimise waste Disposal schemes Reuse??

MCF FORMULARY

thebmj

Sustainable practice: what can I do?

BMJ 2023 ; 383 doi: https://doi.org/10.1136/bmj.p2461 (Published 06 November 2023)
Cite this as: *BMJ* 2023;383:p2461



https://www.bmj.com/content/383/bmj.p2461/infographic

Anaesthetic gases

Avoid to reduce C

Desflurane Guidance

CAI
SALUS DUM VIGILAMUS

April 2024

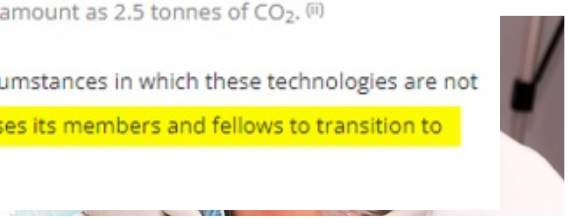
Guidance from the College of Anaesthesiologists of Ireland Relating to Desflurane.

We all have a responsibility to urgently address the climate and biodiversity crises, particularly in the developed world as we are the main cause of both. The College of Anaesthesiologists of Ireland are mindful of the position taken by our colleagues in the Association of Anaesthetists and the Royal College of Anaesthetists to support the decommissioning of desflurane in the NHS. This is based upon their assessment that there are clinically safe, more environmentally friendly and cost-effective alternatives.

The College of Anaesthesiologists of Ireland have considered the following:

- The climate crisis is the largest and most prolonged threat to global health ever described. [i]
- The range of agents and techniques available to anaesthesiologists to provide safe and effective anaesthesia and the estimated carbon footprints of these various agents/techniques.
- All the anaesthetic gases in common use are potent greenhouse gases but desflurane has by far the most potent atmospheric heating effect of these vapours. It has been determined that 1kg of desflurane contributes to atmospheric over-heating in the same amount as 2.5 tonnes of CO_2. [ii]

New technologies may permit vapour capture and subsequent incineration or re-cycling of desflurane. In circumstances in which these technologies are not being used, the College considers that the use of desflurane is no longer justifiable. The College strongly advises its members and fellows to transition to more sustainable anaesthetic techniques.



Precise estimation of carbon footprint possible

Name
CO_2 (carbon
HFO 1234ze MDIs)
HFA152a (po MDIs)
HFA-134a (us
HFA-227ea (
CFC-11 (prev
CFC-12 (prev

GREEN TEAM COMPETITION
CENTRE FOR SUSTAINABLE HEALTHCARE

Reducing The Inhaler Blues, Medicines Optimisation Team

Potential impact

The team aimed to reduce the carbon footprint of inhalers within a GP practice by changing appropriate patients from high carbon footprint MDIs to lower carbon footprint MDIs or DPIs as appropriate.

Environmental sustainability:
20,182 kgCO2e (GP practice) per year, & **2,249,053 kgCO2e** HB wide.

Economic sustainability:
Potential to save **£5,623** (50-95% applicability) annually.

Social sustainability:
- Increased awareness of impact of inhalers.
- Improved asthma control will reduce burden on healthcare services.
- May reduce waiting times for other patients.
- Reduced medication prescriptions save staff time.
- Improved working relationships between Medicines Optimisation team, the GP practice, and the respiratory interface nurse.

Clinical and health outcomes:
- Improved patient inhaler technique.
- Reduced symptoms, exacerbations & overall respiratory health.

GREEN TEAM COMPETITION

GIG CYMRU NHS WALES
Bwrdd Iechyd Prifysgol Hywel Dda University Health Board

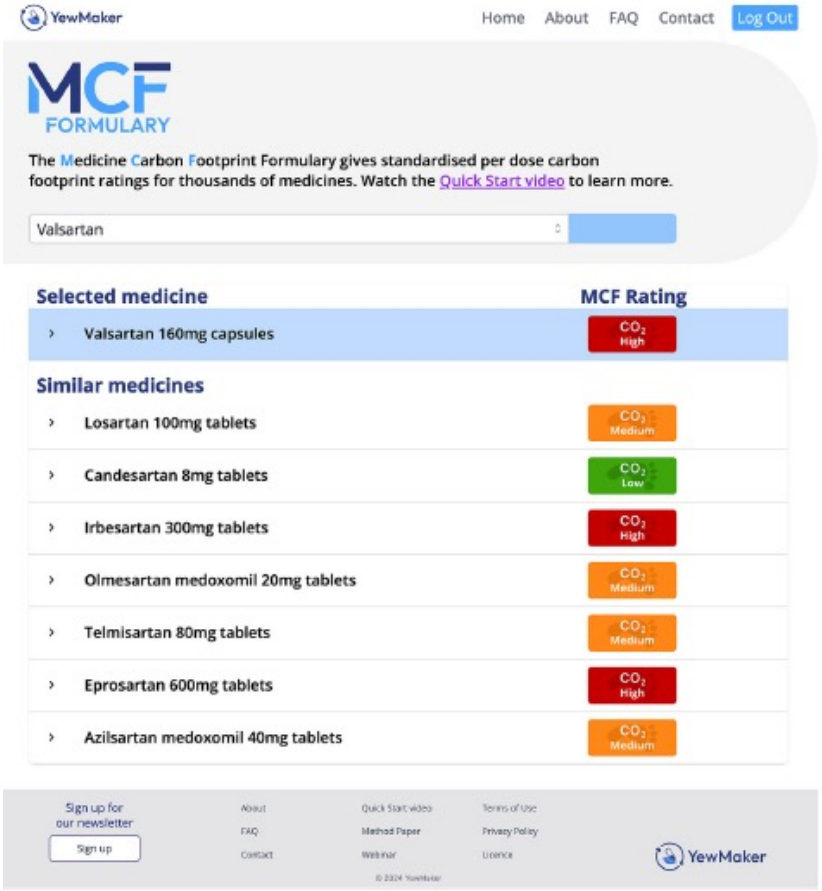
CENTRE for SUSTAINABLE HEALTHCARE

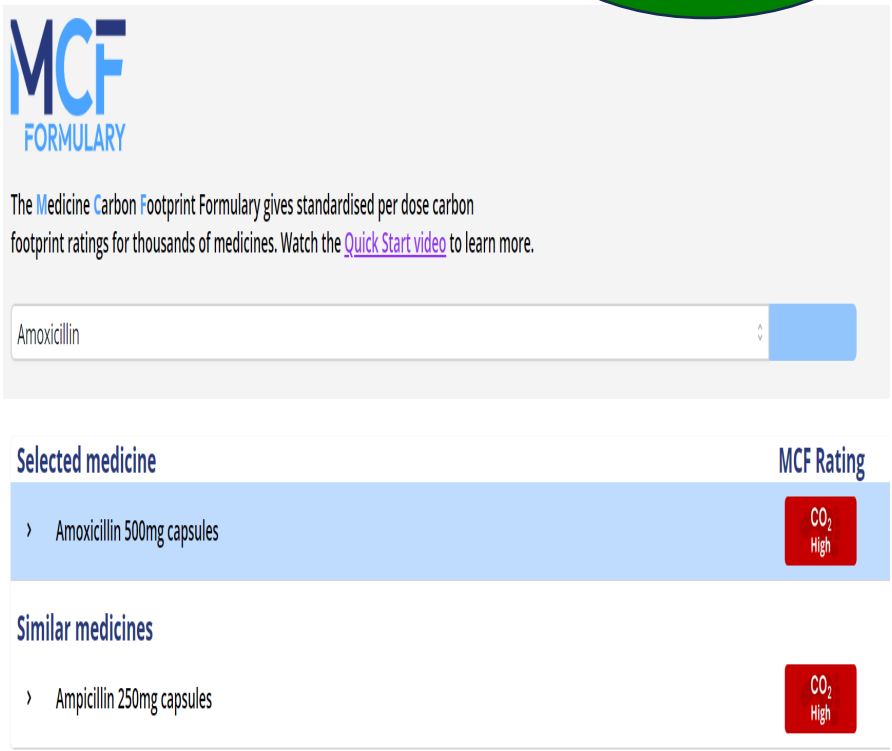
Opportunities to reduce use e.g. Salamol low volume; DPIs or SMIs etc.

HSE Inhalers Action Group 2023-2024

Medicines Carbon Footprint August 2024

Low C alternatives





https://formulary.yewmaker.com

Paving the way for eco-formularies & green procurement

Prescribing

Reduce use

- **Reduce (over)use** – deprescribing, medicines optimisation, MURs
- Non-pharmacological social, green & blu prescribing
- Eco-informed prescribing involving **patients** (health co-benefits)
- Example
  - Elimination of routine low value appts for stable virally suppressed patients
  - Reduction in visits, carbon & workforce savings

Choosing Wisely Canada™

Learning to swallow pills good for patients, parents & the planet (BMJ)

Reduce CFP

- Tablets
  - Less carbon footprint than liquids
  - Less packaging
  - Stored at ambient temperature
  - Can be easily packed down
- Liquids
  - Need for whole bottles
  - No MR preparations, more doses
  - Palatability
- Pill training can be started early
  - Adults also

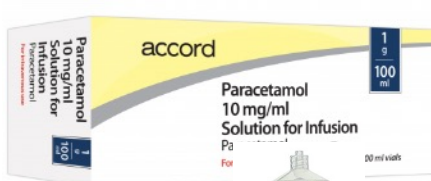
Kidzmed

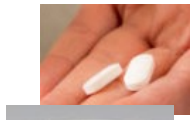
An e-Learning resource for healthcare professionals teaching children to swallow pills

IV over po

Reduce C footprint

- Overuse of **IV medicines** globally
  - Higher C footprint & more packaging
  - Implications for patients
- Routine for 3 day review in antibiotics
  - IVOS
- Extend to other therapeutic areas
  - Initiate po where possible
  - Review IV appropriately
  - Education & training cross disciplinary





0.006 kg/CO2e

1.002 kg/CO2e

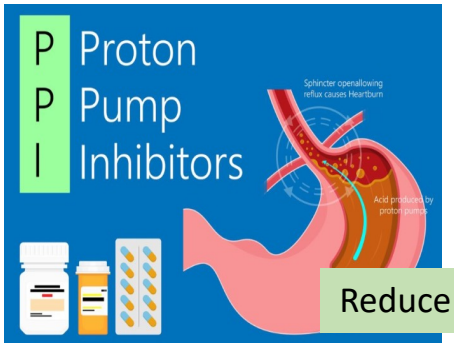
Conclusion: This study demonstrates how working across disciplines we can look for ways in which we can minimize the carbon cost of care. This study finds that when accounting for patient safety, acceptability within pediatrics and the embodied carbon, all non-IV methods are preferable.

https://doi.org/10.1016/j.joclim.2024.100298

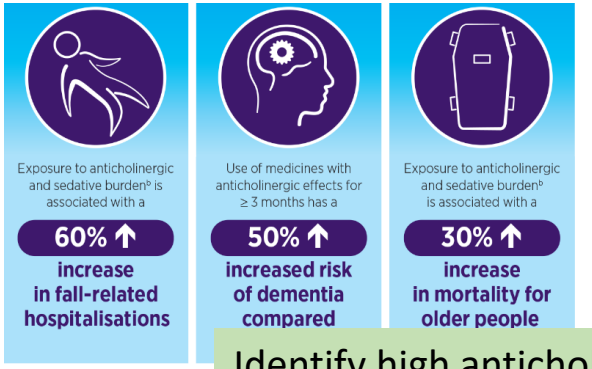
Medicines overuse

Reduce use to reduce C footprint

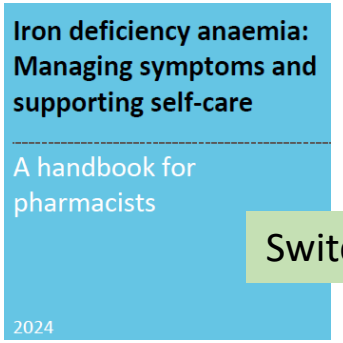
- Many medicines prescribed
  - Low value
  - Not taken
  - Need for disposal
  - Increased potential for AEs
- Identify potential opportunities for medicines optimisation, deprescribing
- Patient interaction episodes - medication reviews, self-care tips



Reduce unnecessary use

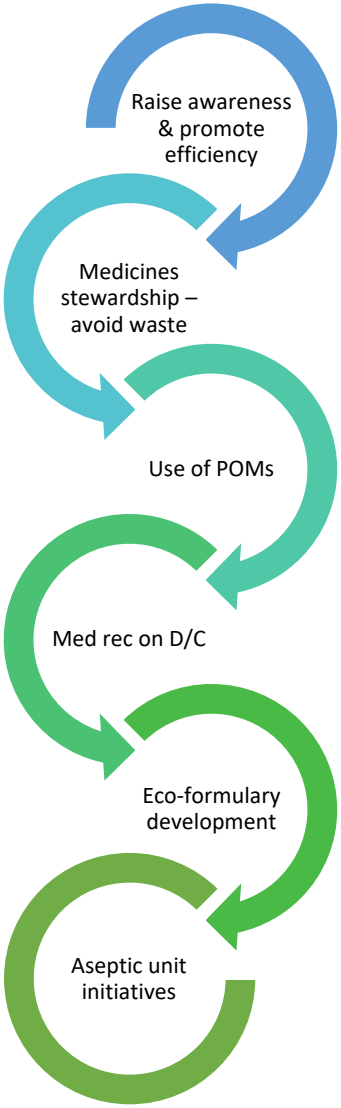


Identify high anticholinergic burden



Switch to once daily

Hospital initiatives



SUSTAINABLE PRACTICE

Reducing drug waste in hospitals

Hayley Blackburn, [1] Catherine Forrester, [2] Min Na Eii[3]

SUSTAINABLE PRACTICE

Reducing drug waste in hospitals

Hayley Blackburn, [1] Catherine Forrester, [2] Min Na Eii[3]

What you need to know

- Drug waste is an important source of financial and environmental waste within healthcare systems
- Audit and analysis of drug inventory management, hospital policies on medicines, and prescribing and utilisation in clinical practice offer opportunities to reduce medicines waste
- Engaging in multidisciplinary collaborations and partnering with patients are useful strategies for promoting sustainable medicines use

Irish Journal of Medical Science (1971 -) (2024) 193:1735–1747
https://doi.org/10.1007/s11845-024-03672-y

REVIEW ARTICLE

Optimising oncology drug expenditure in Ireland

2024

Waste reduction
Avoidance of futile treatment
Altered drug scheduling
Vial sharing

Potential for significant cost savings

Reusing medicines??

Recycle to reduce C footprint

- Pilot project combatting waste in a hospital in Holland
  - Cost savings, improved sustainability & affordability, addressed medicines shortages

Original Investigation

November 16, 2023

Cost Savings and Waste Reduction Through Redispensing Unused Oral Anticancer Drugs

The ROAD Study

90% reduction of medication waste by reusing returned medication from medical wards

Douwe H. van der Meer, Peder Nygård / Hospital pharmacists, Department of Clinical Pharmacy, Isala, Zwolle, The Netherlands

1) What was done?

In our large teaching hospital we distribute medication for individual patients, for the next 24 hours (Picture 1). Because a large amount of distributed medication is returned to the pharmacy, we designed and implemented **a simple new process to reuse returned** medication.

2) Why was it done?

30% of daily distributed medication for individually patients was **not administered** and returned, because:
- Lack of need (clinical performance)
- Discontinuation of prescription
- Early discharge

Standard **procedure is to discard** this medication when the patient is discharged or the prescription is discontinued, because restocking the medication could lead to safety-concerns, like mix-ups.

Picture 1: Filling cabinets
Medication is distributed every 24 hours using filling cabinets which contain about 250 medicine that are frequently used. Every patient-bed has two medication drawers, one in the pharmacy and one on ward, that are swapped in the evening.

Picture 2: Return boxes
Returned medication is placed in front of stock medicine in separate return boxes.

3) How was it done?

We designed a new process to reuse returned medication and performed a **prospective risk assessment.** We identified three major risks and defined the following safety measures:

Risk 1) Mix-ups
- Use 'return-boxes' that are separated from original stock, so employees are aware of higher risk on mix-ups (Picture 2)
- Apply barcode labels on every single unit, by using a barcode multiplier, so every unit is barcode-verified (Picture 3)

Risk 2) Expired medication
- Duplicate barcode labels from the Falsified Medicines Directive (FMD)-code, which includes an expiration date
- If no FMD-code is present: use yellow (instead of white) labels for extra alertness on expiration date
- Increase frequency of checking on expired medication

Risk 3) Non qualitative packaging
Returned medication can be damaged by the nurse, resulting in packages that lack information, like name or strength, and also blisters can be slightly opened
- Every unit that is restocked is checked upon our quality criteria, before reuse is possible

Picture 3: Stand-alone barcode duplicator
By scanning the FMD-code on the original package, duplicate 2D-barcodes are generated and printed. FMD-codes include article number (GTIN), expiration date, serial number (for FMD) and lot-number.

4) What has been achieved?

We implemented this process in January 2023 and measured our waste on two different days, before and after implementation.

Our totals of two days of counting:
295 units/day on average were discarded before implementation
34 units/day on average were discarded after implementation
This is a reduction of about 90%.

By analyzing of our distribution system of 2023 we estimated that we **reused about 218.000 units** (~ 70.000€)

It took about 5-15 minutes extra time each day on a total of 7 employees. No extra personnel was deployed.

5) What is next?

Save non-filling cabinet medication
- About 5% is not reused, despite it meets quality criteria
- This 5% is not included in the assortment of the specific filling cabinet, but withdrawn from a larger separate stock
- Restocking this medication includes updating the inventory management system and requires additional personnel
- We are investigating how to define a process to reuse this medication also, like the other 90%

isala

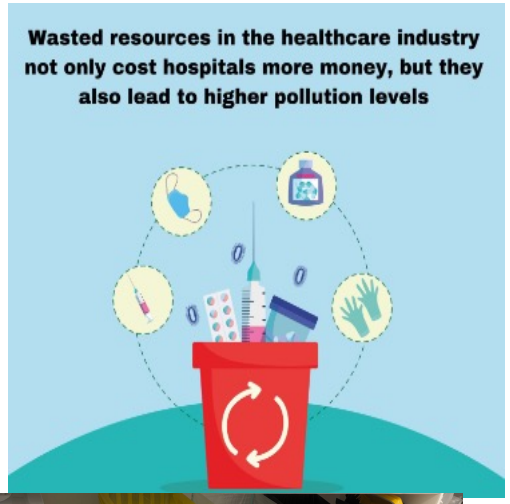
EAHP 2024

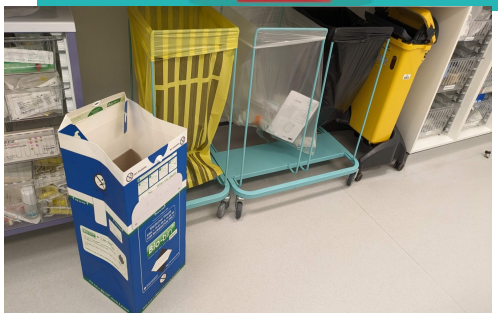
Circular economy for medicines – deformulation of API?

Waste….what a waste

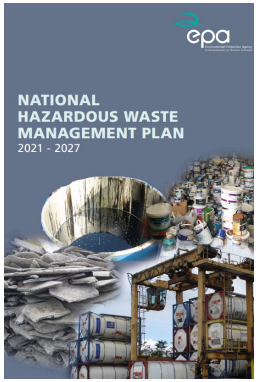
- Optimise waste & recycling across sectors
  - Appropriate bins for waste stream segregation
  - Location of bins & choice, reusable bins
  - Reduce & recycle paper
  - Eliminate plastic food item use
  - Electronic goods

- Community pharmacy specific





Medicines?



Key recommendations:

By 2023, establish national collection of surplus and out-of-date medicines from household waste stream.

- Develop a proposal with options, building on experience with DUMP project; EPA characterisation report; and stakeholder input.
- Implement a nationwide collection system.

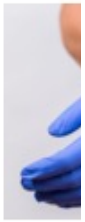
Water pollution: Drugs found in Irish rivers pose 'serious ecological hazard' and risk to human health

No water treatment facility in Ireland has the ability to screen out pharmaceuticals

NEWS By Eithne Dodd Journalist
13:21, 18 MAY 2023 | UPDATED 15:07, 22 MAY 2023

Bookmark

Plastic-de ıcare



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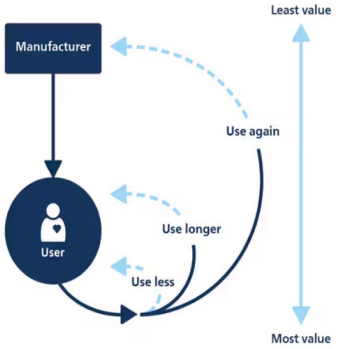
  - Move from ‘



Resource use

- **Decarbonisation** strategies

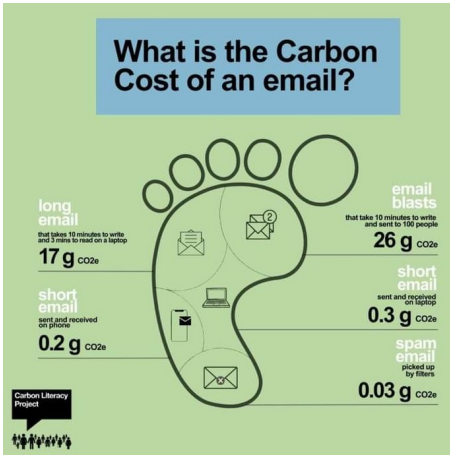
Community pharmacy in Wales reaches net-zero emissions

JDS Evans in Newport, Wales, was the only pharmacy to achieve a gold award as part of the first Greener Primary Care Wales Framework and Award Scheme.

- Renewable energy sources
  - Timers for heating, cooling & electrical devices
  - Use of LED bulbs/motion sensors or timer-controlled lights
  - Retrofitting may be expensive

- Digital footprint – e mail, stored files, photos
  - IT downtime

The unnecessary images you keep are releasing tonnes of CO2



Make patients part of the solution

- Many are environmentally aware
  - Bring them in to the discussion
- HSE strategy to make every contact count - extend
- In community routinely ask your patients to look in the bag to see if there are any incorrect or unwanted medicines***
- Med rec offers opportunities to identify unused medications
- Opportunities to discuss other issues
  - Adaptation strategies
  - Prevention strategies e.g. diet & exercise, health co-benefits of climate action

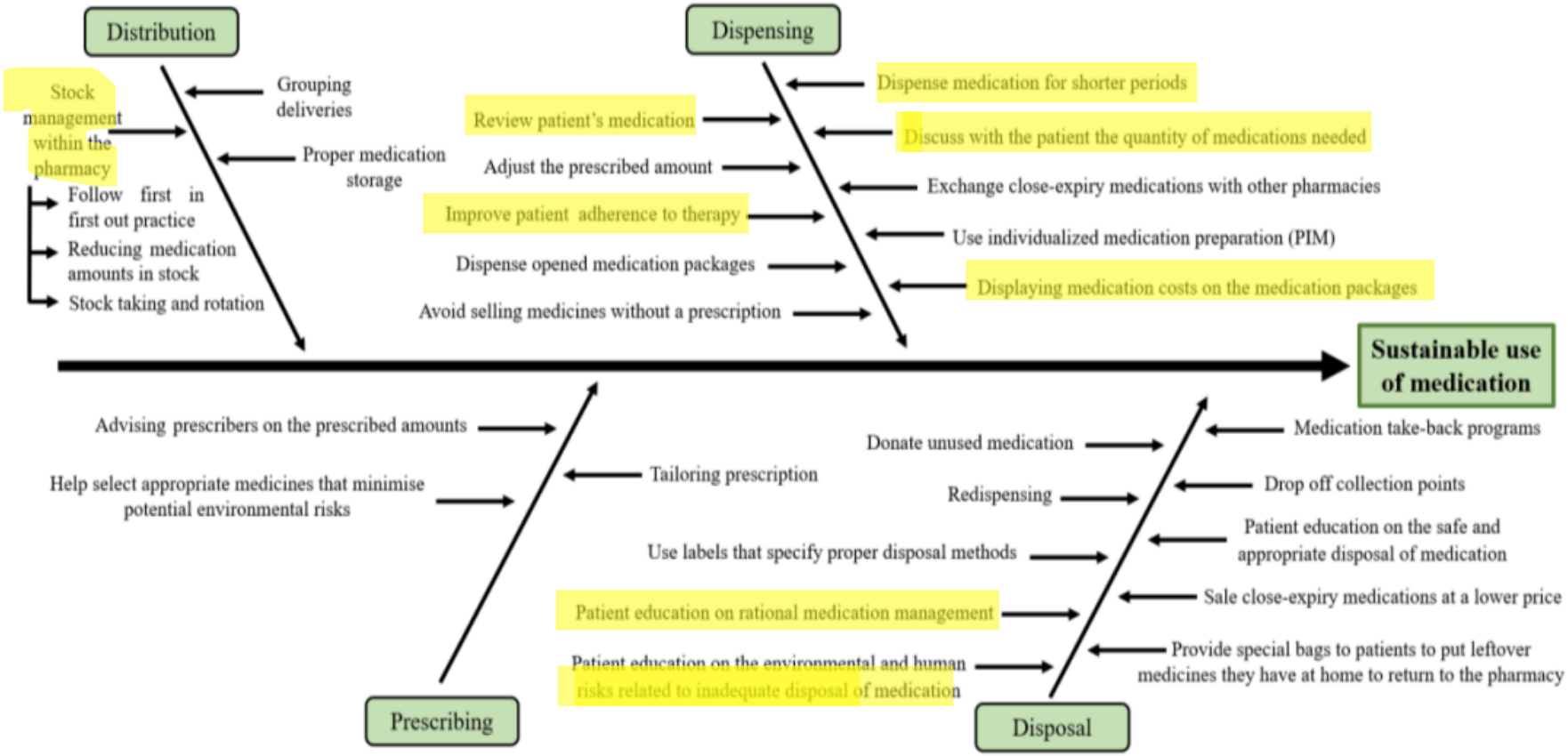
Hospital pharmacists & sustainability

Eco pharmacostewardship?

Sustainable Session - EAHP Environmental Sustainability Working Group - what are the roles of hospital pharmacy teams?

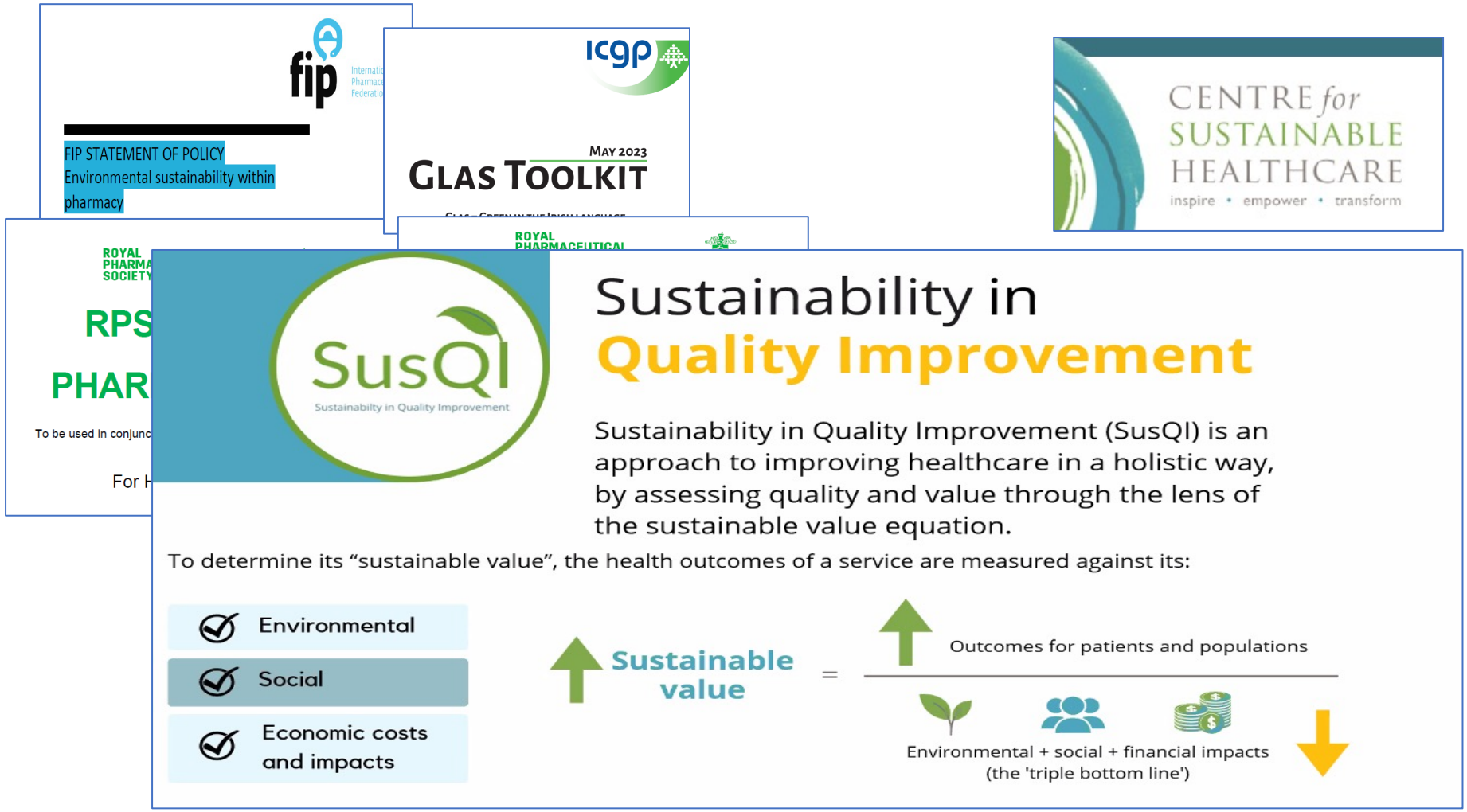
eahp european association of hospital pharmacists congress portal

Community pharmacists & sustainability nudging points (Portugal 2023)



Eco pharmacostewardship?

Getting started – multiple toolkits & guides



Barriers & enablers to adoption of sustainable initiatives

- Individuals
  - Lack of knowledge & awareness
  - **Time** constraints
  - Competing priorities
  - Concerns of increased workload
  - Beliefs & feelings
  - Resistance to change
  - **Cost** implications

- Broader
  - **Cost**
  - Lack of defined targets
  - **Lack of incentives**
  - Inadequate staffing
  - **Lack of leadership/ownership**

- Enablers
  - Engagement,
  - **Motivation**
  - Perceived benefits

- Enablers
  - Provision of resources
  - Leadership/ownership
  - Buy-in from key stakeholders
  - Tracking systems

Seeing results?

Supports required

- Education & training
- Policy & legislation?
- Role of regulator?

General Pharmaceutical Council

August 2024

Carbon net zero action plan for sustainable pharmacy regulation

- Incentivisation & rewards?

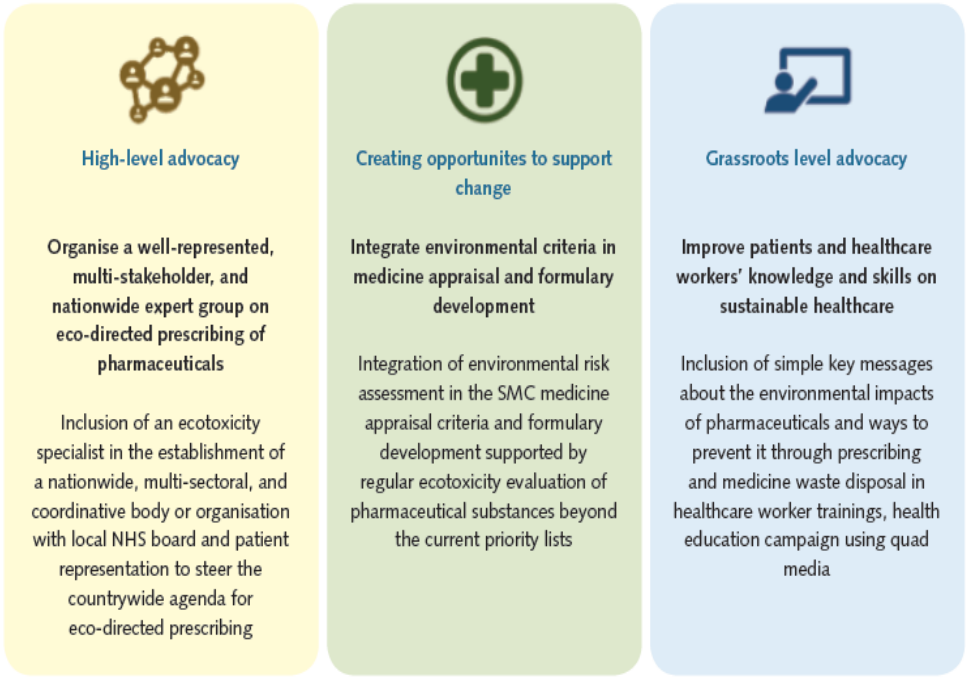


Figure 5. A three-pronged policy approach to initiate the adoption of eco-directed prescribing in Scotland.

- **Protected & dedicated roles** across the health service to deliver on national Climate Action Plan and HSE strategy*

Transformational leadership with a clear vision & collaborative approach

Adopting sustainable pharmacy practices

Carbon savings
Cost savings
Environmental protection

Summary

- Urgent responses to public health threats have been achieved before, why not for this?
- Pharmacy and pharmacists can lead by example & work collaboratively
- *Every little action really does count….despite what is thought…*

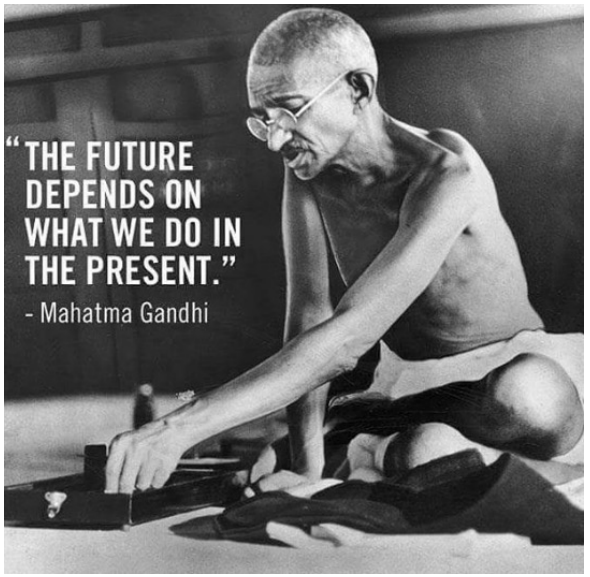
Planetary stewards

Irish PHARMACISTS FOR GREENER HEALTHCARE

RCSI

Thank you - aisoleary@rcsi.com

www.ide.ie



"If working apart we are a force powerful enough to destabilise our planet, surely working together we are powerful enough to save it"

Sir David Attenborough

Dr. Johnnie Collins Jan 2024, IDE

https://www.youtube.com/watch?v=o7EpiXViSIQ&ab_channel=UnitedNations

Empowering the role of pharmacy in sustainability FIP 2023

1. Importance of the role of pharmacists in sustainability
2. Need for continuing **education & training**

Climate change at a crossroads: Embedding environmental sustainability into the core of pharmacy education

Annalise Mathers, MPH, BSc; Shirley Fan, PharmD; Zubin Austin, BScPhm, MBA, MISc, PhD

3. Importance of interdisciplinary collaboration and partnerships
4. Importance of monitoring and evaluation
5. Utilising technology

ACTIONS FOR SUSTAINABLE HEALTHCARE

Tackling climate change: the pivotal role of clinicians

Jeffrey Braithwaite,[1] Anuradha Pichumani,[2] Philip Crowley[3]

3 | PHARMACISTS AS SUSTAINABILITY LEADERS

Pharmacists are well-positioned to be leaders of sustainability initiatives affecting many facets of health care from drug development to disposal. We participate in pharmaceutical research, where innovative work is needed to fully embrace "Green Chemistry" principles such as

impact and additional innovation. To achieve that, additional pharmacist education is needed.

4 | THE NEED FOR PHARMACIST AND STUDENT EDUCATION

Education is necessary to engage the largest number of pharmacists in environmental solutions and to empower them to become health care