

A person in a dark suit and light purple shirt is holding a small, colorful paper house model. The house is white with a purple roof and blue and pink accents. It has a window with a grid pattern and a small arched window in the roof. The background is a blurred office setting with a green plant on the left and a desk with a notebook and pen in the foreground.

The National HMO Network

WINTER CONFERENCE
Nov 2022

Dr Hector Altamirano-Medina

Institute for Environmental Design and Engineering at the
Bartlett School of Environment, Energy and Resources



Dr Altamirano-medina is an Associate Professor at the Institute for Environmental Design and Engineering at the Bartlett School of Environment, Energy and Resources. He is an interdisciplinary scientist interested in the health and well-being impact of the built environment and a wide-ranging experience in the indoor environment and operational performance of buildings, the development of mould and humidity conditions, in-situ monitoring, field surveys and experimental setup of buildings and their components.

He trained as an architect and energy and environmental designer at the Universidad Central de Chile and the Architectural Association School of Architecture in London. He has several years of experience working for the Chilean Government, Universities, NGOs, and in consultancy. The outcome of Dr Altamirano-Medina's PhD research at UCL on the Humidity in Dwellings project (2005-2007) for DCLG was incorporated into Appendix A of the ADF 2010 and now forms part of the Building Regulations for England and Wales. Dr Altamirano-Medina is working on moisture-related research projects prepared in partnership with industry and public institutions and with the strong support of the UK Centre for Moisture in Buildings (UKCMB), where he serves as Academic Director.

Challenges caused by excessive moisture and how they can be addressed.

Dr Hector Altamirano-Medina

A moisture safe future

- Hector Altamirano – h.altamirano-medina@ucl.ac.uk
- UKCMB Academic Director
- UCL Institute for Environmental Design and Engineering
- Bartlett School of Energy Environmental and Resources





- The UKCMB is an independent, not for profit, public good organisation initially run by:
 - the Building Research Establishment (BRE),
 - Heriot Watt University and
 - the London School of Hygiene and Tropical Medicine
 - University College London
- The UKCMB works together with partners from academia, government, industry and the public to substantially **improve** the way moisture risk is understood and managed in the UK
- Very little research in the UK on moisture in buildings, a lack of good guidance, and minimal public and industry understanding.

The logo for the Building Research Establishment (BRE) consists of the lowercase letters "bre" in a bold, yellow, sans-serif font.



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Consequences of excessive moisture in buildings

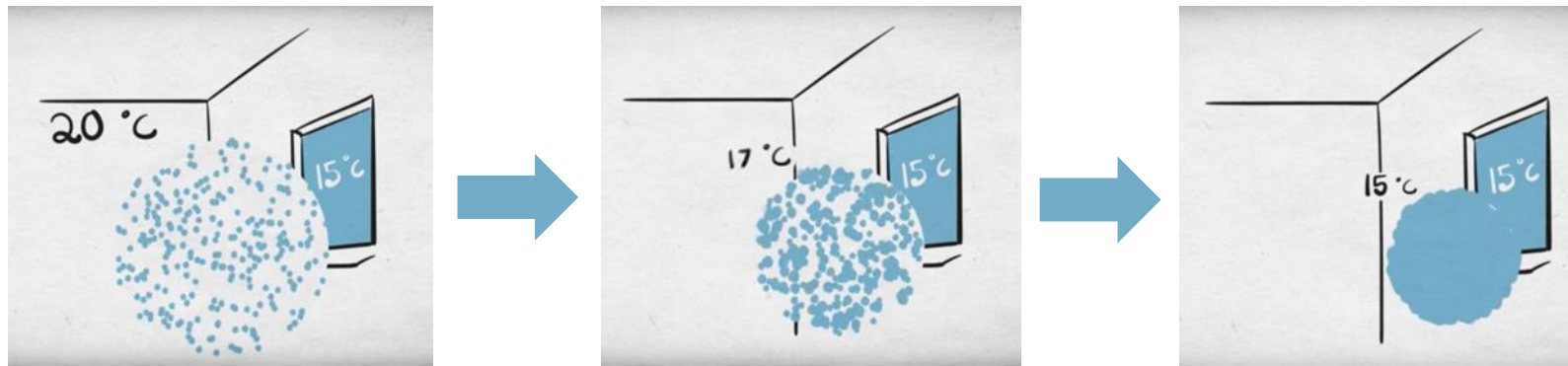


- Excessive moisture can alter the balance of the building and may affect both its integrity and the health and wellbeing of its occupants. The most common consequences found in buildings with excess moisture
 - Condensation
 - Expansion and contraction
 - Corrosion
 - Spalling: frost damage
 - Efflorescence: salts crystallisation
 - Delamination
 - Reduced thermal resistance
 - Wood rot
 - Dust mites
 - Mould growth
 - Health effects of mould and dust mites



Condensation

- When there is more water vapour than the air can hold it becomes full up and condenses into liquid water (**condensation**). This happens when warm moisture rich air reach a cold surface like windows or cold walls in winter.
- Condensation form as air suddenly cool against the surface and the **holding capacity of the air is reduced**





Health Effects

- Literature reveals evidence of a possible association but more evidence is required
- Limited evidence of an association exists
- Good evidence of an association exists
- Evidence of a causal relationship exists

	Dampness/ Mould	House ust Mite	VOCs (formalde- hyde)<	Endotoxin	Ergosterol	(1-3)-β-D- glucan	Dry Air
Rhinitis							
Cough							
Wheeze							
Respiratory infections							
Respiratory symptoms							
Asthma development							
Asthma exacerbation							
Dyspnoea							
Hypersensitivity pneumonitis (allergic alvelolitis)							
Bronchitis							
Common cold							
Sinusitis							
Inhalation fever, Humidifier fever							
Throat symptoms							
Eye symptoms							
Malaise (nausea, vomiting, stomach ache, diarrhoea, fever, chills, fatigue)							
Skin symptoms, eczema							
Mental health problems (incl. headache, difficulties concentrating)							

Health Effects

<http://www.nhs.uk/chq/Pages/Can-damp-and-mould-affect-my-health.aspx?CategoryID=87>

You are here: [Common health questions](#) / Can damp and mould affect my health?

Can damp and mould affect my health?

Yes, if you have damp and mould you're more likely to have respiratory problems, [respiratory infections](#), [allergies](#) or [asthma](#). Damp and mould can also affect the immune system.

Who's affected?

Some people are more sensitive than others, including:

- babies and children
- elderly people
- those with existing skin problems, such as [eczema](#)
- those with respiratory problems, such as allergies and [asthma](#)
- those with a weakened immune system

These people should stay away from damp and mould.

How does it affect your health?

Moulds produce allergens (substances that can cause an allergic reaction), irritants and, sometimes, toxic substances. Inhaling or touching mould spores may cause an allergic reaction, such as sneezing, a runny nose, red eyes and skin rash. Moulds can also cause asthma attacks.

Really a problem?

Lewisham Momentum @LewMomentum · Nov 15
 @CattfordStruggle The company Lewisham uses for running the social housing at Eros House will do anything other than maintenance, repairs and renovation. Bed bugs and damp and exploitation is everywhere. This has to stop. We should be able to be proud of our social housing.



zoe conway @zoeconway1
 This is Virginia Gill's bedroom wall. She lives in Fish Preston where a home insulation scheme has gone terribly wrong. She doesn't know who to turn to for help. Listen to her story at 0730 @BBCr4today #r4today



Rough sleeper @RoughSleep_UK · 4h
 Lest we forget
 RooftopHousingGroup @Rooftop_Housing
 "He's had far too many trips to hospital thanks to this property being the way it is with the damp and mould"

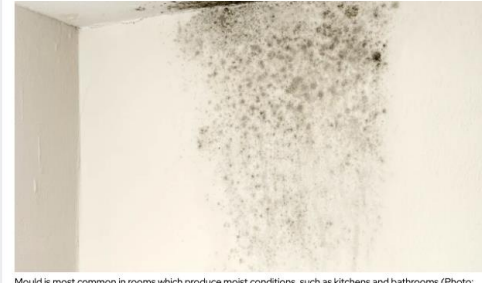


Mum's worry over mould affecting her asthmatic son
 A MUM worried about her asthmatic son is desperate to find a home that isn't 'riddled with mould'.
 @eveshamjournal.co.uk

News Politics Opinion Culture Money Sport Life & More Puzzles
 UK World Scotland Health Education Technology Science Environment Business

Mouldy homes will be worse this year as people turn off heating in cost of living crisis, say experts

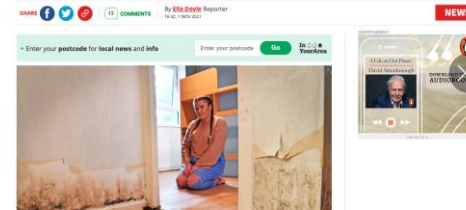
It's going to be a perfect storm and I don't think we can easily get out of this because if you've got bills to pay, you've got bills to pay



Mould is most common in rooms which produce most conditions, such as kitchens and bathrooms (Photo: oneblue/Getty)

Single mum, 29, stuck in flat with 'black mould' that 'made son, 10, so ill he missed school for weeks'

Kirsty said her son is 'scared to live in his own home' due to their housing conditions



Little Awaab Ishak, playing outside (Image: MEN Media)

- NEWS
- Celebs
- Politics
- TV
- Football
- Money

Toddler died after being exposed to damp and mould in his home

Awaab Ishak tragically died shortly after his second birthday in his home on the Freehold estate in Rochdale, rampant with damp and mould, conditions which also blight properties housing several other families

By Stephen Topping & Kieren Williams, News Reporter

08:42, 4 Nov 2022 | UPDATED 23:04, 5 Nov 2022

100 COMMENTS

London Assembly @LondonAssembly · Nov 22
 Have you ever experienced cold and damp in your home?

#AssemblyEnv are investigating cold and damp homes in London and want to hear about your experiences.

Tell us here: london.gov.uk/talk-london/en...?



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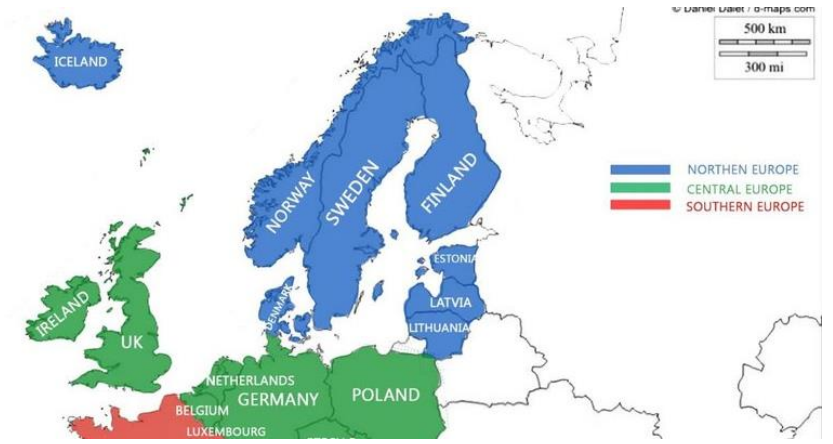
The Sun @TheSun · Nov 12
 Inside couple's 'nightmare' council house that's so damp MUSHROOMS grow on the walls



Inside couple's mould-ridden 'nightmare' council house that's so damp MUSHROOMS grow on the walls
 thesun.co.uk

3 3 2

Really a problem?



- **18% of occupants** in northern European countries lived in damp housing
 - Gunnbjörnsdóttir MI et al. Prevalence and incidence of respiratory symptoms in relation to indoor dampness: the RHINE study. Thorax. 2006 Mar 1;61(3):221–5
- **10 - 25% of homes** in European countries with climates similar to that of the UK were estimated to have dampness
 - World Health Organization. Environmental burden of disease associated with inadequate housing. Copenhagen; 2011.
- **16.5% of the** European building stock had signs of dampness
 - Haverinen-Shaughnessy U. Prevalence of dampness and mold in European housing stock. J Expo Sci Environ Epidemiol. 2012;22(5):461– 467

Really a problem?

- In **1982** was estimated that in England **2 million dwellings** (11.8% of all household), were affected by dampness, with condensation being the cause in 60%. Sanders & Cornish
- The **1986 English House Condition Survey** was estimated that **3.5 million dwellings** (20% of all households) experience some mould or damage to decoration due to damp.
- The **1991 English House Condition Survey** found that **10.4 million** homes were affected by mould growth
- The **1996 Northern Ireland House Survey** found that **16% of homes** experience some form of dampness or mould (95.000)
- The **1996 English House Condition Survey** had found that **15% of all households** had scores in the Mould severity index. (2.6 million)



Severity of mould growth

	mild	moderate	severe
Any room	1		
Moderate		+1	
Severe			+2
Living rooms		+1	

- The 2011 English House Condition Survey found that 7% of homes had some problems with damp (1.4 million), 3.5% affected by condensation and mould
- The 2015 English House Condition Survey found that 5% of homes had some problems with damp

Mould growing in buildings could have a large effect on:

- Aesthetics of the building
- Cost / maintenance of buildings due to mould related damage
- Health of occupants (Physical and Mental health)



image source: www.mold-kill.com

How to prevent mould growth in buildings?







Orchid / Orchidaceae
22,000 and 26,000 species

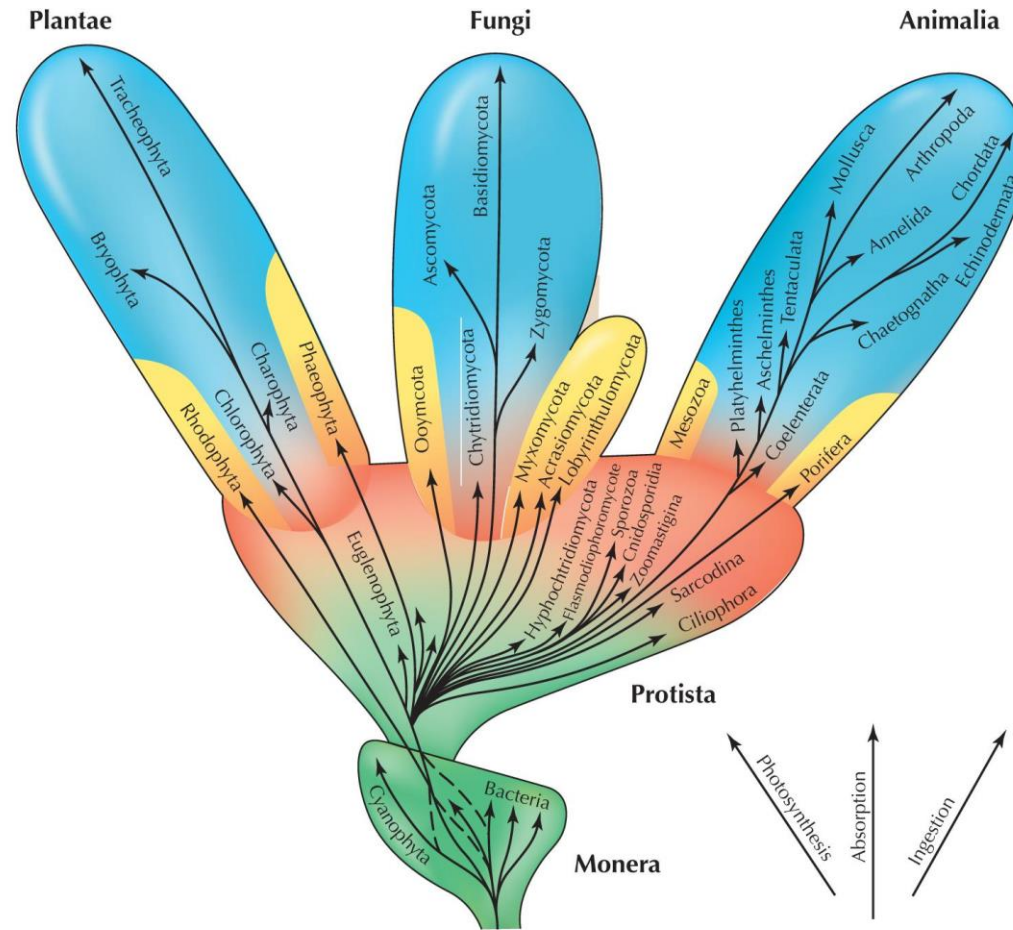
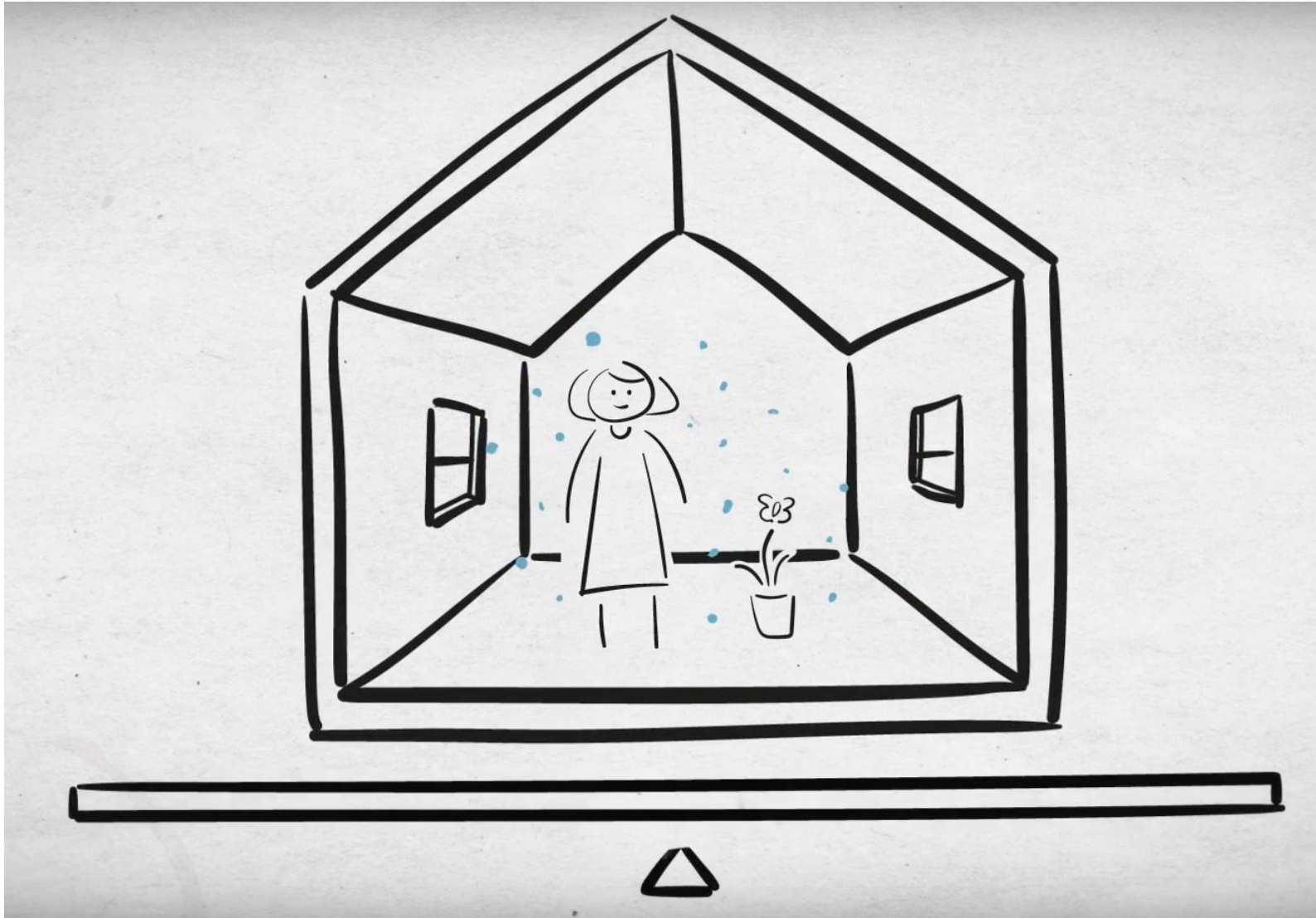


FIGURE 5.15. Whittaker's five-kingdom tree. This system contains five kingdoms based on three levels of organization: prokaryotic (kingdom Monera), eukaryotic unicellular (kingdom Protista), and eukaryotic multicellular and multinucleate (kingdoms Fungi, Animalia, and Plantae). The three kingdoms at the top of the figure are distinguished mainly by differences in nutrition (see the *inset*).

5.15, redrawn from Whittaker R.H., *Science* **163**: 150–160, © 1969 American Association for the Advancement of Science

Evolution © 2007 Cold Spring Harbor Laboratory Press



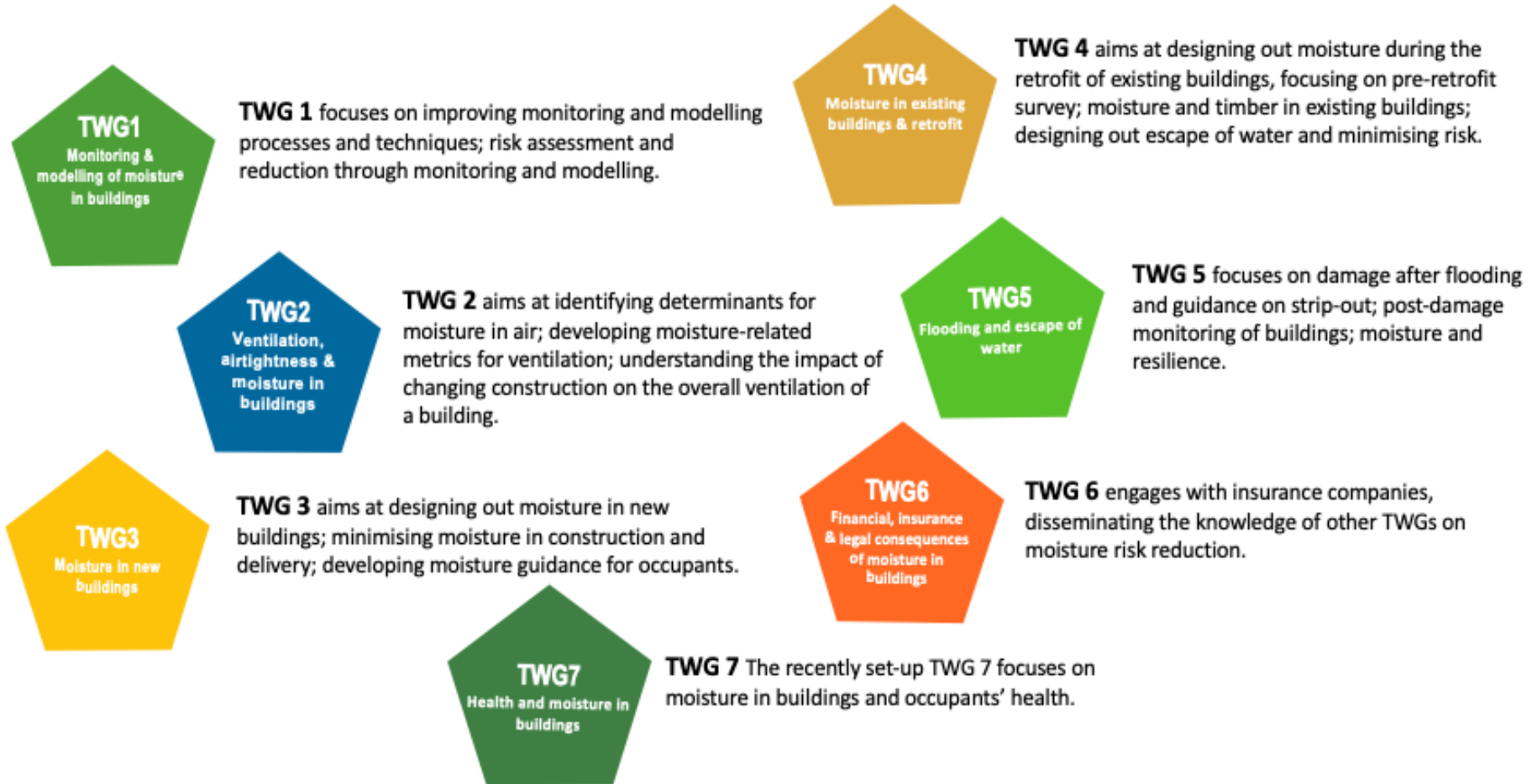
Management Team



- **Patricia Hart**, Communications and Coordinator
- **Peter Rickaby**, Business Manager
- **Colin King**, Commercial Director
- **Valentina Marincioni**, Technical Director Working Group Manager
- **Yasemin D. Aktas**, Deputy Academic Director
- **Hector Altamirano**, Academic Director



Technical Working Groups



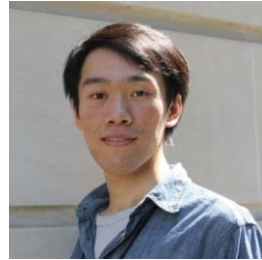
Doctoral Researcher - Affiliates



Through UCL, UKCMB has been able to encourage individuals taking up doctoral research studentships to focus their research on **moisture-related topics**. UKCMB has facilitated the funding of research studentships at UCL by network members.



Morena
Ferreira



Hengrui
Zhu



Athina
Petsou



Pedro Maximo
Rocha



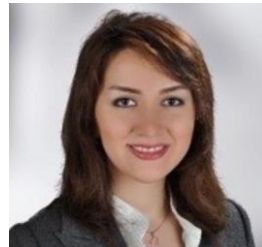
Spyros
Efthymiopoulos



Naomi
Grint



Jalal
Ahmed



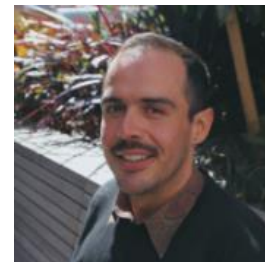
Negin
Jahed



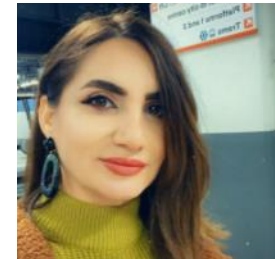
Toby
Cambray



Morana
Novak



Hector
Padilla



Gulala
Aziz

Policy and standards work



- Members of the UKCMB have been actively involved in the development of:
- **BS 5250** – ‘Code of practice for control of condensation in buildings’
- **PAS 2030, 2035 and 2038**
- **BSI Retrofit Standards Task Group**
- **BSI CB401 Retrofit Committee**
- **Part C, F & L of the Building Regulations**

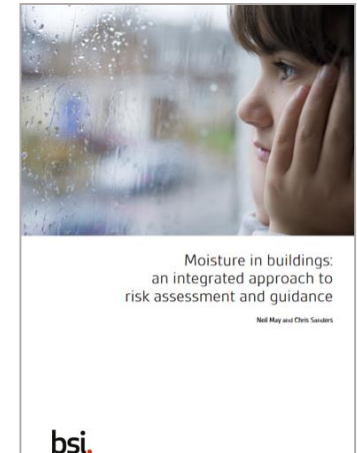


Training for Moisture in Buildings: Understanding and Managing Moisture Risk in Building



This course is for new starters and professionals in the building industry who wish **to learn the practical implications of assessing and managing moisture risks** in their new-build designs and retrofit strategies.

- The course is based around the four principles set out in *Moisture in buildings: an integrated approach to risk assessment and guidance* by Neil May and Chris Sanders (BSI, London, 2018) and in the forthcoming new edition of BS 5250 Control of condensation in buildings.
- These principles, known as '**the four Cs**', are:
 - **Context:** understanding the building's history, setting, construction, condition, occupancy pattern, etc.
 - **Coherence:** adopting a consistent, integrated, whole-building approach to all aspects of new-build and retrofit.
 - **Caution:** identifying, assessing and managing moisture risks, and, where knowledge is limited, erring on the side of caution.
 - **Capacity:** ensuring adequate capacity in building systems rather than over-optimising, to allow for unexpected or changing circumstances.



Moisture Balance Calculator

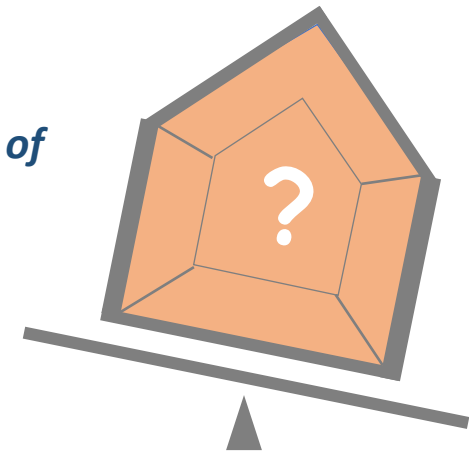
- This tool aims to give a better understanding of the moisture balance in your home and the factors at play. If your home is out of balance, you might be able to identify easy ways to regain moisture balance and create a healthier home

MOISTURE GENERATION	OCCUPANCY	BUILDING CONDITION	HEATING	VENTILATION
The moisture generation section looks at the creation of water vapour from the main daily activities within the house (bathing, washing and cooking)	The occupancy section looks at amount of people in the house, when are they in and how it feels to be in the home in terms of space	The building condition section looks at leaks, repairs around the house, cleaning routines and any mould problems noticed.	The heating section looks at the temperature the home is kept at and how it is controlled	The ventilation section looks at the movement of air within the house, the daily ventilation routines and how the air feels within the home.

- A balanced amount of moisture is needed to maintain a healthy home. This means having a building which is **not too dry and not too humid**. Keeping your home in balance can be tricky as there are a lot factors to think about such as the moisture you generate in cooking, washing and so on, and your heating, ventilation and maintenance.

- A balanced home should have:
- Good insulation standards and well built to avoid cold internal surfaces
- Moisture generation is not too high
- The home is well heated in cool or cold weather
- Ventilation is increased at times when moisture generation is higher
- Properly maintained to detect and fix any rainwater or plumbing leaks

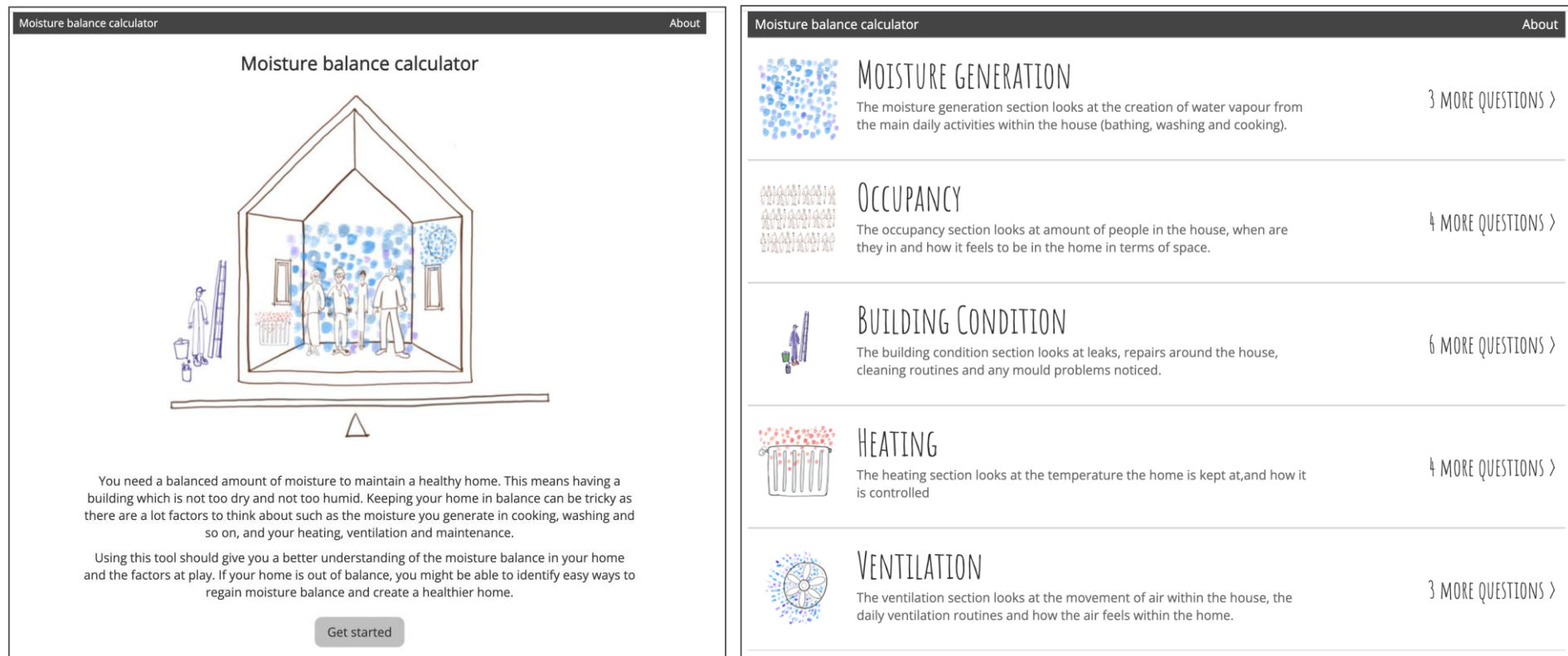
Possibly out of balance?



Moisture Balance Calculator

<https://moisture-balance.netlify.com>

- This tool aims to give a better understanding of the moisture balance in your home and the factors at play. If your home is out of balance, you might be able to identify easy ways to regain moisture balance and create a healthier home



Moisture balance calculator

Moisture balance calculator

You need a balanced amount of moisture to maintain a healthy home. This means having a building which is not too dry and not too humid. Keeping your home in balance can be tricky as there are a lot of factors to think about such as the moisture you generate in cooking, washing and so on, and your heating, ventilation and maintenance.

Using this tool should give you a better understanding of the moisture balance in your home and the factors at play. If your home is out of balance, you might be able to identify easy ways to regain moisture balance and create a healthier home.

Get started

Moisture balance calculator

MOISTURE GENERATION

The moisture generation section looks at the creation of water vapour from the main daily activities within the house (bathing, washing and cooking).

3 MORE QUESTIONS >

OCCUPANCY

The occupancy section looks at amount of people in the house, when are they in and how it feels to be in the home in terms of space.

4 MORE QUESTIONS >

BUILDING CONDITION

The building condition section looks at leaks, repairs around the house, cleaning routines and any mould problems noticed.

6 MORE QUESTIONS >

HEATING

The heating section looks at the temperature the home is kept at, and how it is controlled

4 MORE QUESTIONS >

VENTILATION

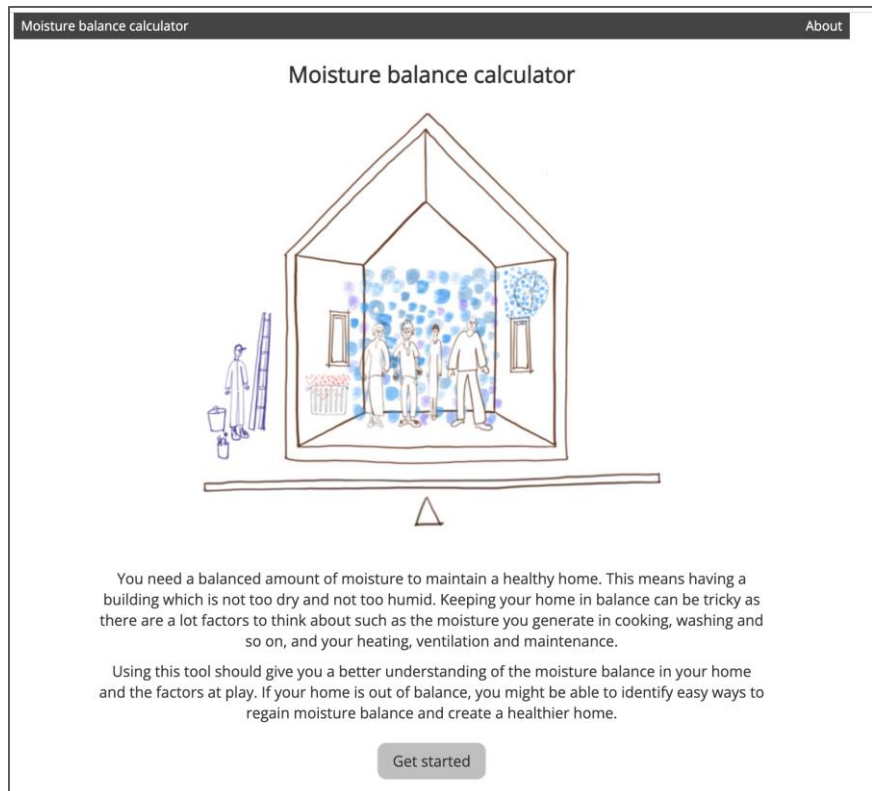
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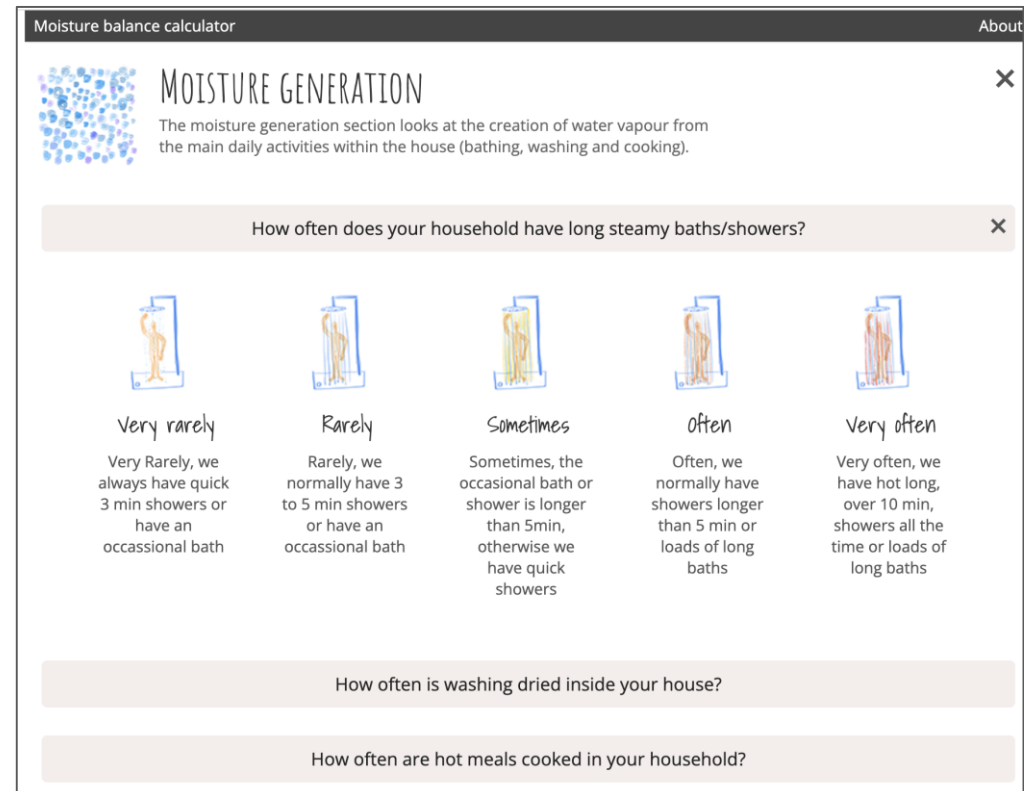


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Using this tool should give you a better understanding of the moisture balance in your home and the factors at play. If your home is out of balance, you might be able to identify easy ways to regain moisture balance and create a healthier home.

Get started



MOISTURE GENERATION

The moisture generation section looks at the creation of water vapour from the main daily activities within the house (bathing, washing and cooking).

How often does your household have long steamy baths/showers?

Very rarely	Rarely	Sometimes	Often	Very often
Very Rarely, we always have quick 3 min showers or have an occasional bath	Rarely, we normally have 3 to 5 min showers or have an occasional bath	Sometimes, the occasional bath or shower is longer than 5min, otherwise we have quick showers	Often, we normally have showers longer than 5 min or loads of long baths	Very often, we have hot long, over 10 min, showers all the time or loads of long baths

How often is washing dried inside your house?


How often are hot meals cooked in your household?

Moisture Balance Calculator

<https://moisture-balance.netlify.com>

- This tool aims to give a better understanding of the moisture balance in your home and the factors at play. If your home is out of balance, you might be able to identify easy ways to regain moisture balance and create a healthier home

Thank you for completing the questionnaire!



POSSIBLY OUT OF BALANCE

Your home is possibly out of balance with respect to moisture.

Don't panic. Address what you can of the areas below but don't worry if changes in these areas are beyond what you can do. Keep a watchful eye towards moisture issues such as damp or mould within the home.

Areas of attention

Based on your answers, there are areas where changes could help bring your home into balance.


The most significant areas are:

- How draughty is your house? **Air tight**
- How often do you have a warm house/the heating on (during the heating season (Oct-Apr)? **When cold**
- What areas of the house do you heat? **Room we are in plus bedroom**
- How cluttered and full of things does the house feel? **Cluttered**
- How often do you clean the house? **Rarely**

These are marked by a **!** symbol in the survey. Try changing your answers to see what actions could help bring your home back into balance:

[Review your answers](#)

Thank you for completing the questionnaire!



OUT OF BALANCE

Your home is out of balance with respect to moisture.

You need to address as many of the areas below as you can to try and get the house back into balance. Changes in some areas may be beyond what you can do. Aim to reduce moisture generation, keep up maintenance, keep the house warm and ventilate well.

Areas of attention

Based on your answers, there are areas where changes could help bring your home into balance.


The most significant areas are:

- How draughty is your house? **Air tight**
- How often is the house ventilated (either by a ventilation system or by opening windows)? **Rarely**
- Do you have any water coming in through windows, doors or leaks? **All the time**
- How often does your household have long steamy baths/showers? **Very often**
- How often is washing dried inside your house? **All the time**

These are marked by a **!** symbol in the survey. Try changing your answers to see what actions could help bring your home back into balance:

[Review your answers](#)

Thank you for completing the questionnaire!



IN BALANCE

Well done! Based on your answers your home is now in balance with respect to moisture.

Feel free to explore the effect of changing your answers:

[Review your answers](#)

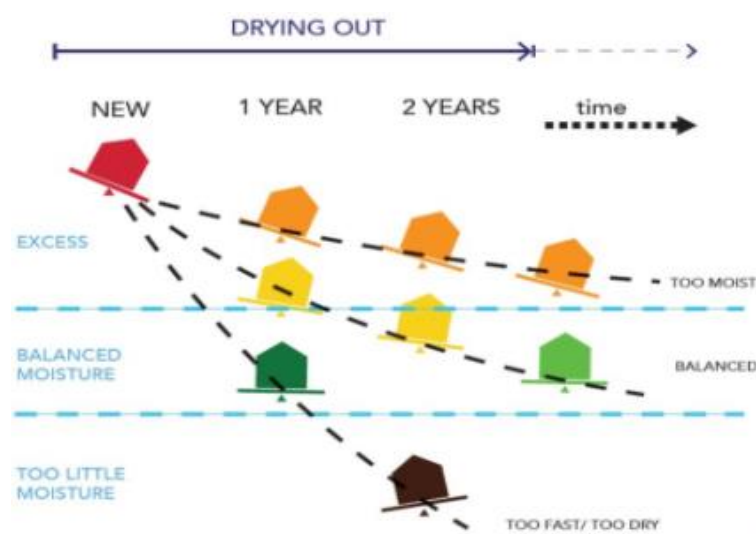
Your changed answers

- Do you have any water coming in through windows, doors or leaks? **Never** (was Rarely)
- How cluttered and full of things does the house feel? **Not at all** (was Cluttered)
- How often do you clean the house? **Very Regularly** (was Rarely)
- Have you noticed any mould/dampness around your window reveals? **None** (was A little bit)
- Have you noticed any mould/dampness on external facing wall or at edges? **None** (was A little bit)

Moisture in new homes

A guide for occupants

- This guide explains **where moisture comes from** and the things you can do to **maintain the right moisture balance** in new homes. The guide discusses:
 - Moisture balance
 - Where moisture comes from
 - Drying out your new home Importance of ventilation
 - Tackling moisture-related problems

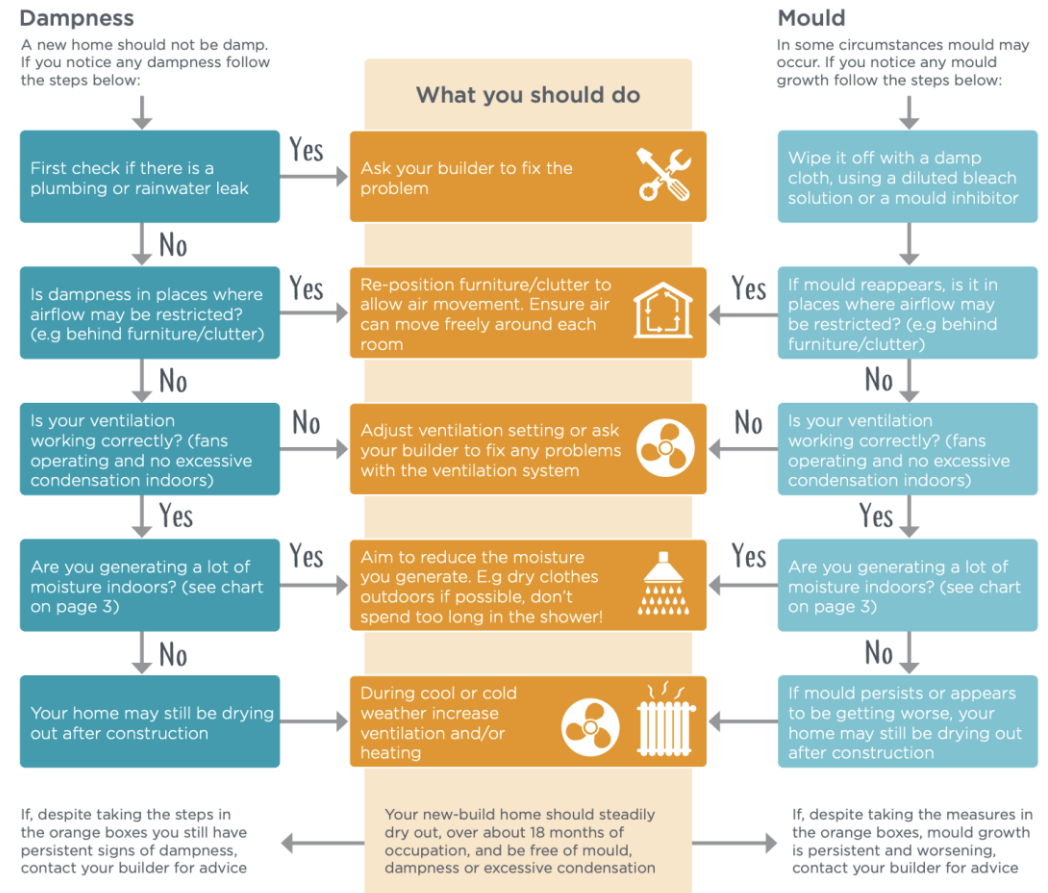


	Main sources of moisture in a home (litres per year)				Total moisture generated each year from these main sources
	Breathing	Cooking	Showering	Drying clothes	
Working couple <ul style="list-style-type: none">◆ Working away from home◆ Electric cooker◆ Daily 5 min showers◆ Tumble dry washing or dry outdoors	550 litres	250 litres	180 litres	Zero	About 100 Full buckets
Retired couple <ul style="list-style-type: none">◆ At home most of the time◆ Gas cooker◆ Daily 5 min showers◆ Washing dried indoors on racks or radiators	790 litres	1020 litres	180 litres	160 litres	About 215 Full buckets
Family of four (two infants) <ul style="list-style-type: none">◆ One adult at work◆ Electric cooker◆ Daily 5 min showers (baths for infants)◆ Tumble dry washing or dry outdoors	970 litres	360 litres	200 litres	Zero	About 155 Full buckets
Family of four (two teenagers) <ul style="list-style-type: none">◆ Nobody at home during day◆ Gas cooker◆ Daily 5 min showers◆ Washing dried indoors on racks or radiators	1110 litres	770 litres	360 litres	550 litres	About 280 Full buckets

Moisture in new homes

A guide for occupants

- This guide was created to help understanding moisture in a new-build home. Supported by NHBC Foundation



A moisture safe future

How can we help you?



<https://ukcmb.org>

Questions

Contact Hector Altamirano
UKCMB Academic Director

E: h.altamirano-medina@ucl.ac.uk

