



Radon In Earthships & Sustainable Construction

Could Living Closer to The Earth Be Hazardous?

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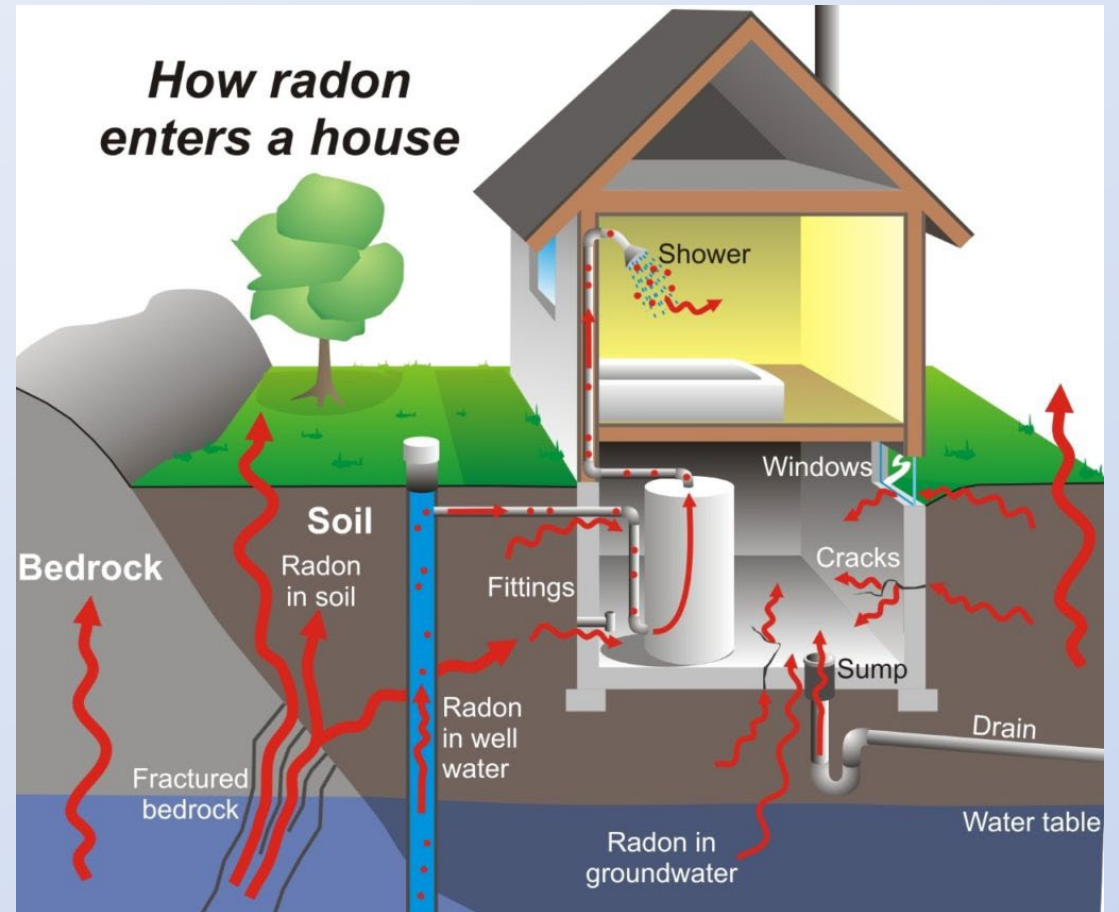
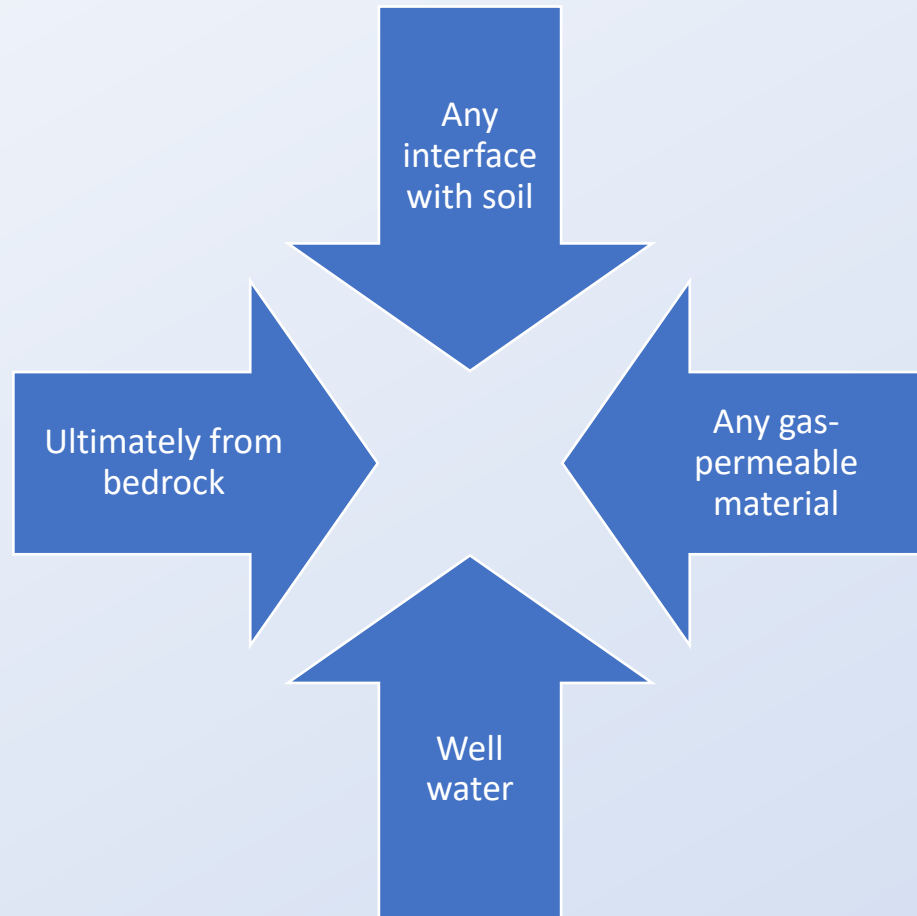
Radiation Control Bureau



Topic Map

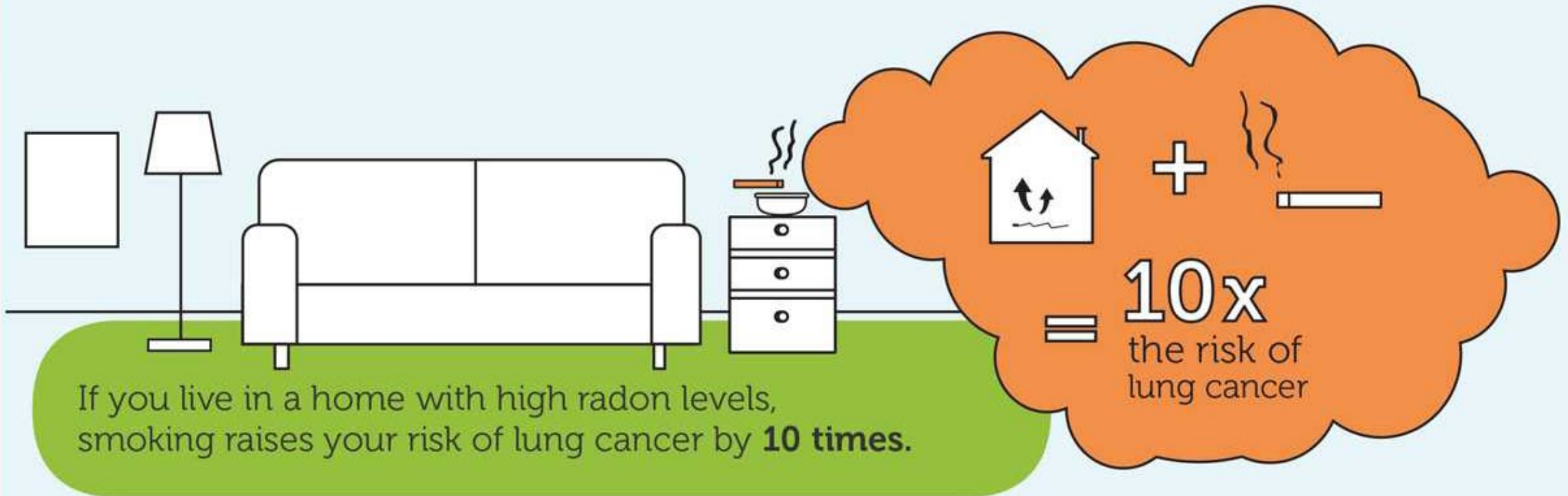
- Radon Sources
- Radon Health Effects In NM
- Conventional Radon Mitigation
- Sustainable construction
- Earthship Construction
- Earthship Radon Data
- Other construction vulnerabilities
- Suggested Low-Impact Mitigation
- Final Thoughts

Radon Sources



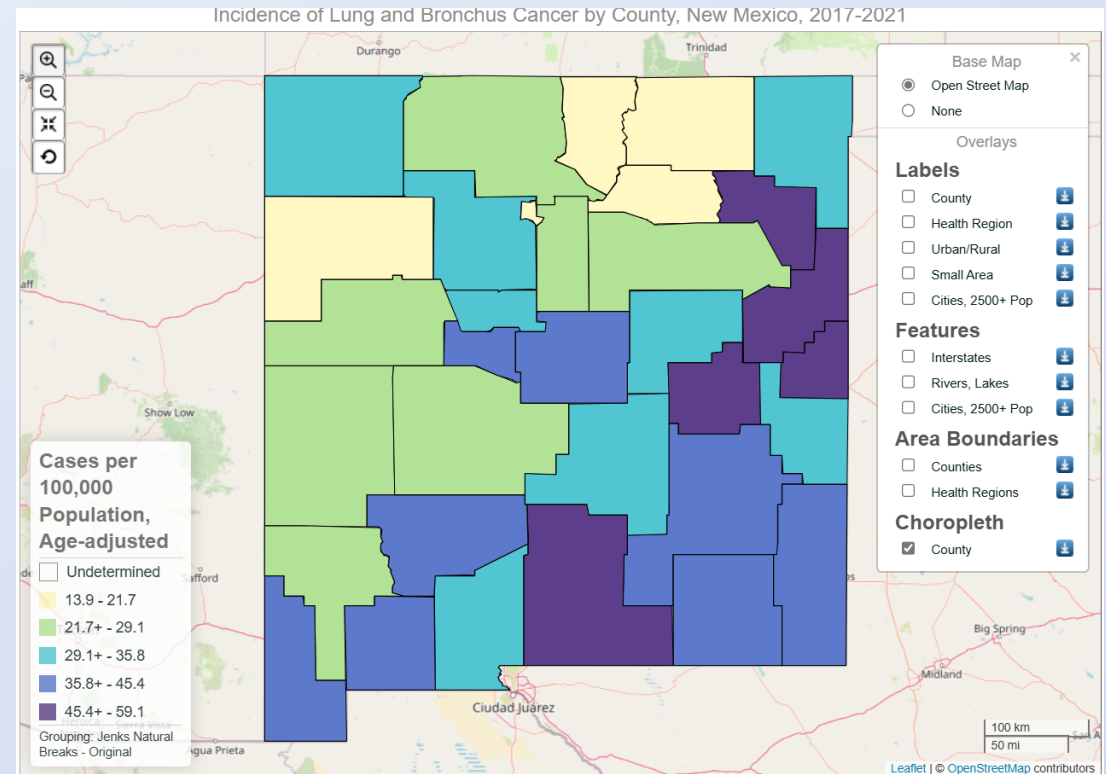
https://4f6693b0.delivery.rocketcdn.me/wp-content/uploads/2019/09/thumbnail_radon-into-house-1024x858.jpg

Radon and Smoking: A Dangerous Combination



Respiratory Cancer in NM

- 2007-2020 Instances of respiratory cancer (cancer.com)
 - Non-Hispanic 10025
 - Hispanic 3764
 - American Indian 324
- Higher instances in E and SE of the state



<https://nmtracking.doh.nm.gov/dataportal/indicator/view/CancerIncidLung.Cnty.html>

Conventional Mitigation

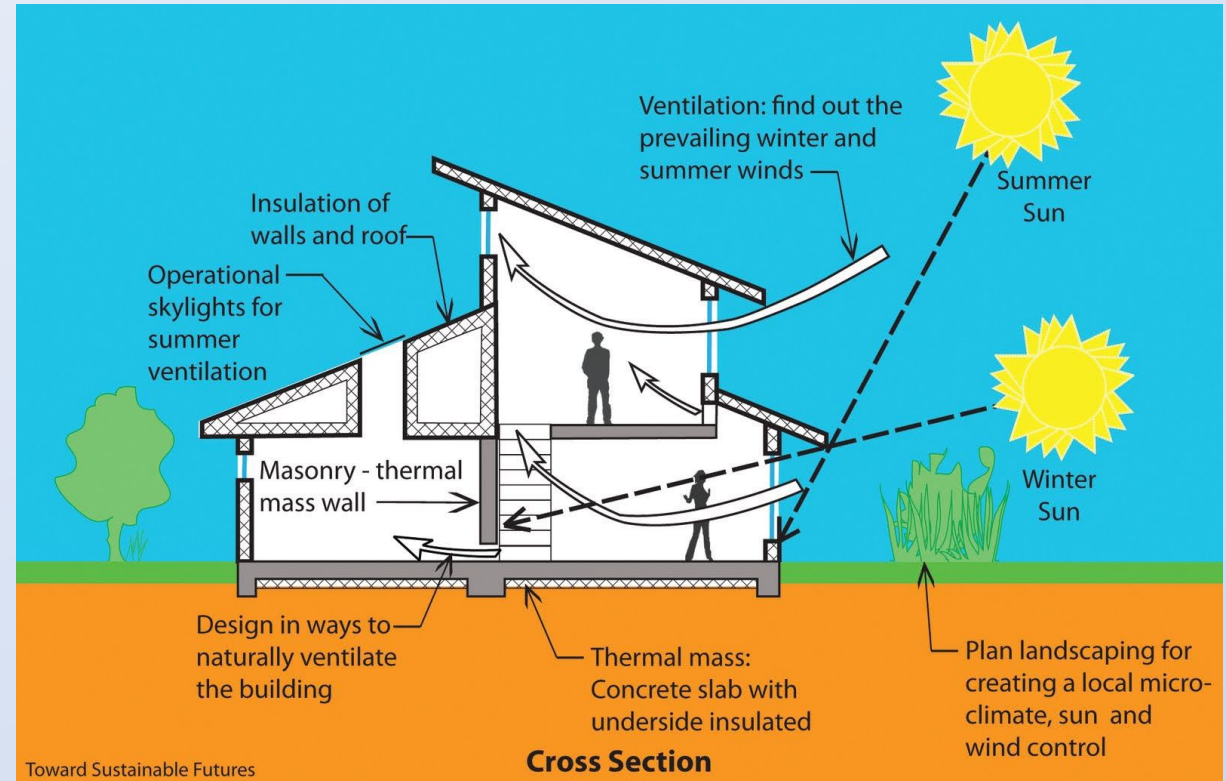
- Active
 - Vent with inline fan
- Passive
 - Vent line only



<https://airflowacademy.com/wp-content/uploads/2021/05/Sub-slab-depressurization-radon-mitgation-system.png>

Sustainable Construction

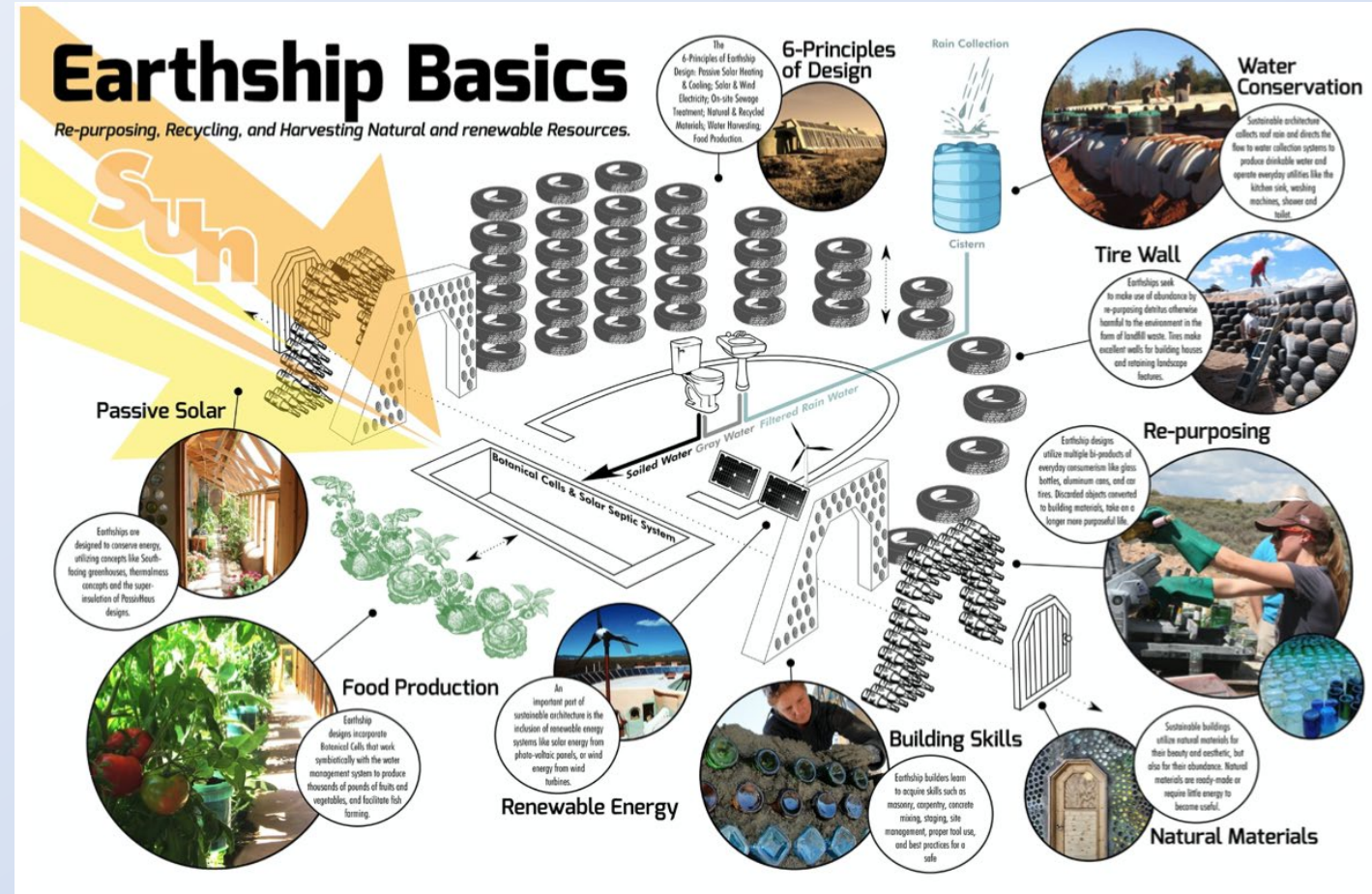
- Active
 - Efficient energy (geothermal, solar)
- Passive
 - Natural convection & solar heating
- Commonalities
 - Minimize energy use
 - Produce & consume on site
 - Use convection



<https://i.pinimg.com/originals/c1/41/50/c141500b76145099fd801431b6c00f25.jpg>

Earthship Construction

- Fundamentals
 - Recycling/Repurposing
 - Rain collection for water
 - Black/greywater treatment in open dirt planter drain field
 - Solar for electric
 - Natural convection
 - Tire/trash/dirt walls for thermal mass



Earthship Wall Construction & Cooling Tubes



<https://cdn.britannica.com/45/193245-050-9751B9D1/Earthship-Big-Sky-Montana.jpg>



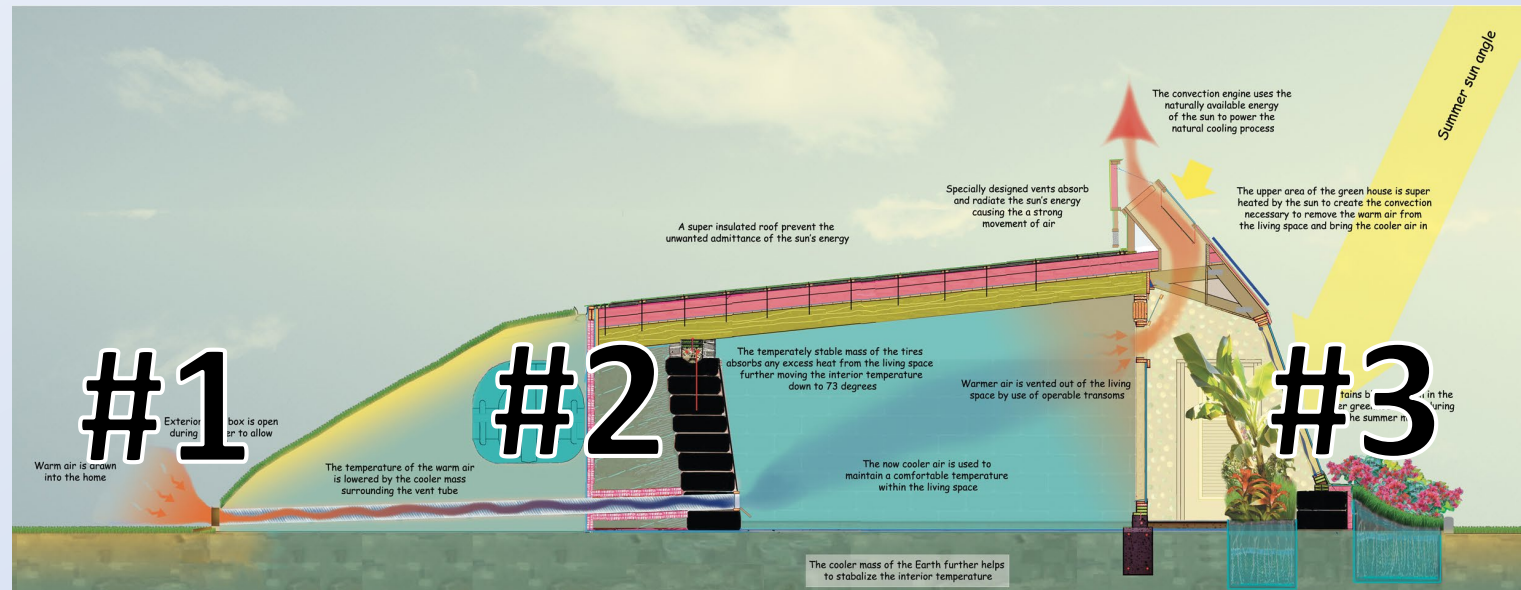
https://3.bp.blogspot.com/-RljYzsw3_7c/T5NbyEbmuel/AAAAAAAAAGA/0Wn0Bns-Zm4/s1600/photo.JPG



<https://earthship.com/2020/03/27/cooling-tubes/>

Air Management In Earthships

- Cooling tubes draw from ground level
 - Radon source 1
- Walls packed with dirt & trash
 - Radon source 2
- Open earth planters & no concrete
 - Radon source 3
- Close the tubes = trap the radon



<https://th.bing.com/th/id/R.93d5ca58fdfa35723060a37cf5749c37?rik=X5T7oI%2fTv4AZrw&pid=ImgRaw&r=0>

Earthship Radon Data Taos, NM

- EPA recommends remediation at 4 pCi/L
- Closed cooling tubes in winter
 - 40 pCi/L
- Open all cooling tubes in summer
 - 1 pCi/L
- Self-solving problem?
 - 45.8 F in the bedroom
 - 38 F outdoor temp



Are Other Dwelling Types Vulnerable?

- Hill-side & short stilt homes
- Fiberglass/porous/non-airtight structures in RV's
- Tiny homes
 - DIY and/or mixed materials
 - Often low ventilation
 - Often shed-like design with loft



<https://i.pinimg.com/originals/d5/c3/96/d5c396887551cef9170bbaa060b307b5.png>



<https://padtinyhouses.com/wp-content/uploads/2016/09/Hikari-Box-Tiny-House-Exterior.jpg>

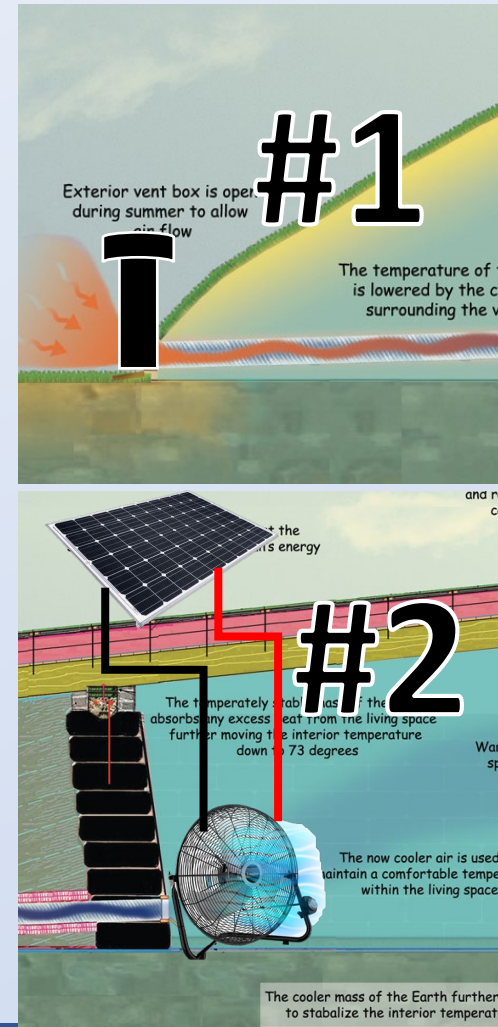
Yurts

- Stay in a Yurt in Radium Hot Springs, British Columbia
 - Air concentration of Radon ~23 pCi/L
- Little active ventilation
- Maybe windows
- No foundation
- Often no air management



Suggested Low-Impact Mitigation

- Earthship proposed mitigation:
 1. Raise cooling tube intake height to ~3-4 ft (Background vs ground concentration)
 2. Add fan/s to the cooling tubes for active ventilation using some of the solar output
 3. Sealing the “bathtub” planters where grey & black water are ‘treated’
- Winter months:
 - Dress warmly?
 - Crowd suggestions?





Final Thoughts

- Off-grid dwellers generally
 - Don't want to deal with permits
 - Trust their own 'experts'
 - Prefer DIY to HOA's
 - Hold recycling as a high virtue
- Viable solutions need to fit the above constraints
- Better adoption of 'natural methods' of radon mitigation
 - This is where we need some innovative cooperation with industry



Questions?

- Thanks for listening!
- If you have ideas or solutions, please follow up so we may share with constituents.