

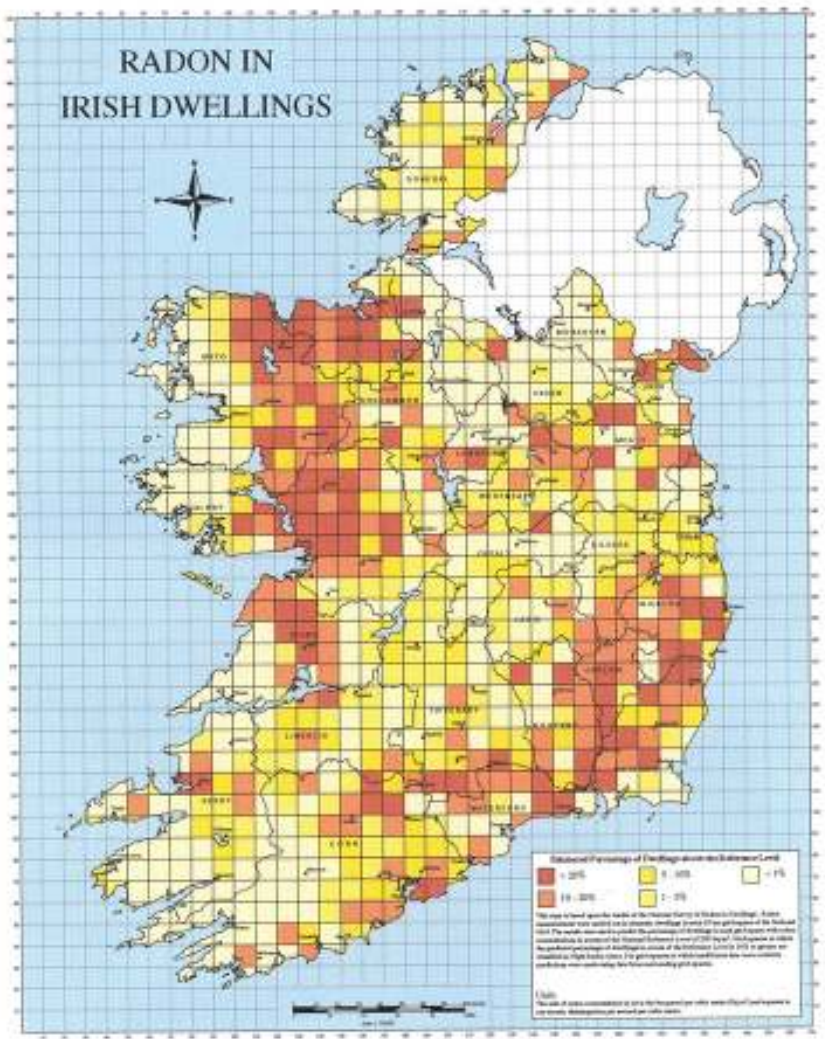
# Radon Preven(ta)tive Measures in New Dwellings

*Effectiveness and Awareness*

*Catherine Organo - Scientific Officer  
Natural Radioactivity Advice and Information Section  
RPII*



# RADON IN IRISH DWELLINGS



**Radiological Protection Institute of Ireland**  
 An Institiúid Éireannach um Chosaint Raideolaíoch

**Further Information:**  
 Information regarding radon in Irish dwellings is available on a number of web sites. For more information, please visit the following websites:  
 www.rpii.ie  
 www.epa.ie  
 www.doh.gov.ie  
 www.doh.gov.uk  
 www.doh.gov.au  
 www.doh.gov.ca  
 www.doh.gov.hk  
 www.doh.gov.in  
 www.doh.gov.jp  
 www.doh.gov.kr  
 www.doh.gov.tw  
 www.doh.gov.za  
 www.doh.gov.zw



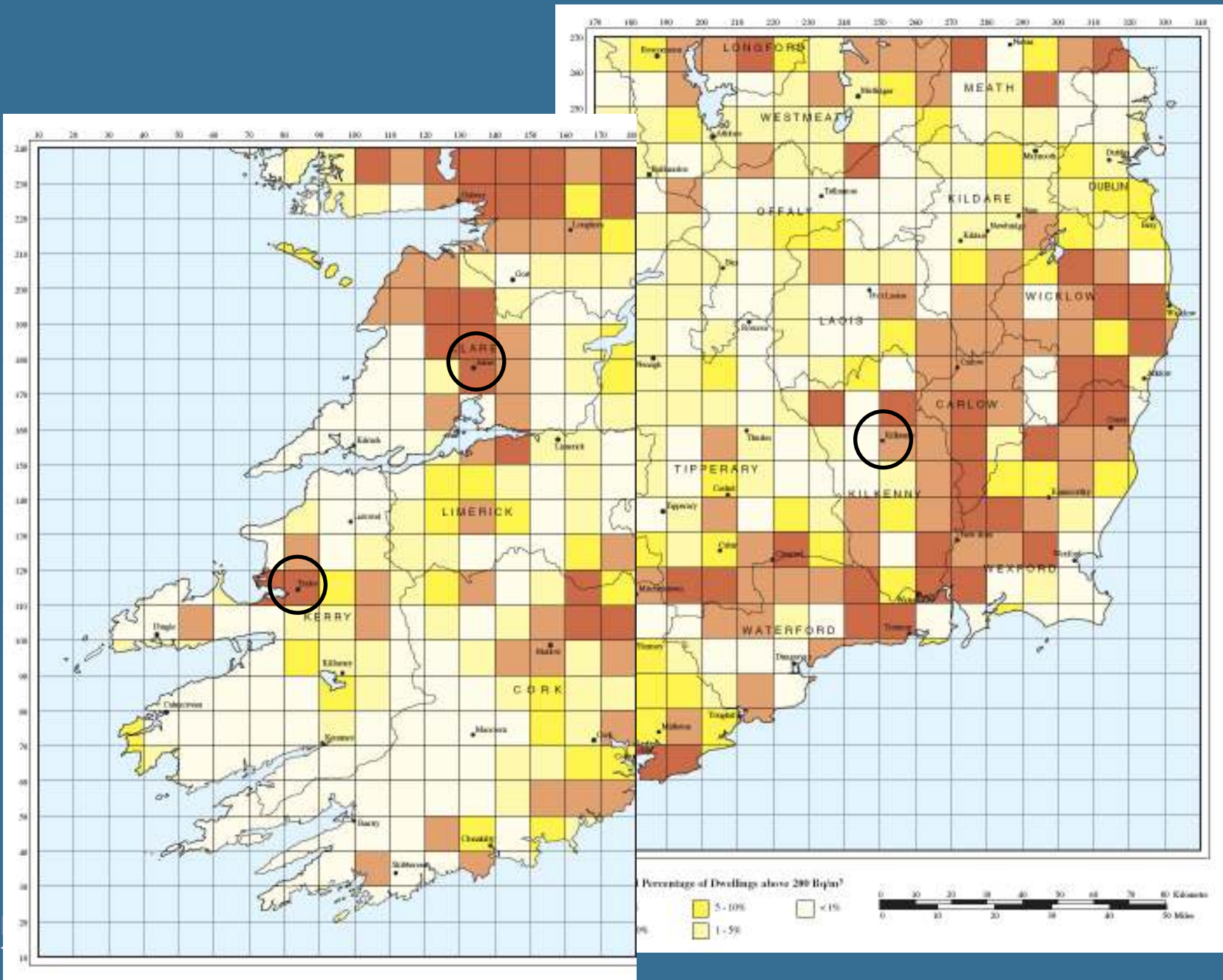
- **1997 amending Building Regulations** require that “reasonable precautions shall be taken to avoid danger to health & safety caused by dangerous substances (including contaminants) found on or in the ground to be covered by a building” (Requirement C3)
- **Technical Guidance Document C** issued in support of these Regulations specifying radon preventive measures for new buildings: from **1 July 1998**, dwellings or other long-stay residential buildings located
  - **In High Radon Areas**
    - ✘ Have to be provided with a fully sealed membrane of low permeability over footprint of the building (radon barrier)
    - ✘ **AND** with a potential means of extracting radon from the substructure (such as standby sump with connecting pipe work)
  - **In other areas**
    - ✘ Have to be provided with a potential means of radon extraction from the substructure (such as standby sump with connecting pipe work)



# The RPII “Building Regulations” Surveys

- To assess effect of Building Regulations on radon levels in new dwellings by comparing radon levels in houses built before and after introduction of 1997 Building Regulations
- To assess householders’ awareness of radon preventive measures incorporated into their home
- Areas chosen: High Radon Area (barrier effectiveness), high housing density, high sampling rate in the NRS, dwelling construction data in computer readable format





# Ennis Pilot Survey (2001)

- **Pre-Building Regulations** = houses measured as part of National Radon Survey (houses all built before 1<sup>st</sup> July 1998)
- **Post-Building Regulations** = set of houses that have commenced construction after 1<sup>st</sup> July 1998



# Tralee Survey (2002)

- Strictly speaking, National Radon Survey data and measurements in homes built since 1998 cannot be compared directly
  - NRS homes built over wider time period, broad range of construction practices, building materials, ageing characteristics
  - NRS homes selected at random from electoral register, one-year measurement, 2 detectors
- **Pre-Building Regulations** (Control dataset) = set of houses that have commenced construction before 1<sup>st</sup> July 1998 (1992-1997)
- **Post-Building Regulations** = set of houses that have commenced construction after 1<sup>st</sup> July 1998 (1999-2000)
- **Third dataset** = National Radon Survey (houses all built before 1<sup>st</sup> July 1998)



# Kilkenny Survey (2003)

- **Pre-Building Regulations** (Control dataset) = set of houses that have commenced construction before 1<sup>st</sup> July 1998 (1992-1997)
- **Post-Building Regulations** = set of houses that have commenced construction after 1<sup>st</sup> July 1998 (1999-2002)
- **Third dataset** = National Radon Survey (houses all built before 1<sup>st</sup> July 1998)

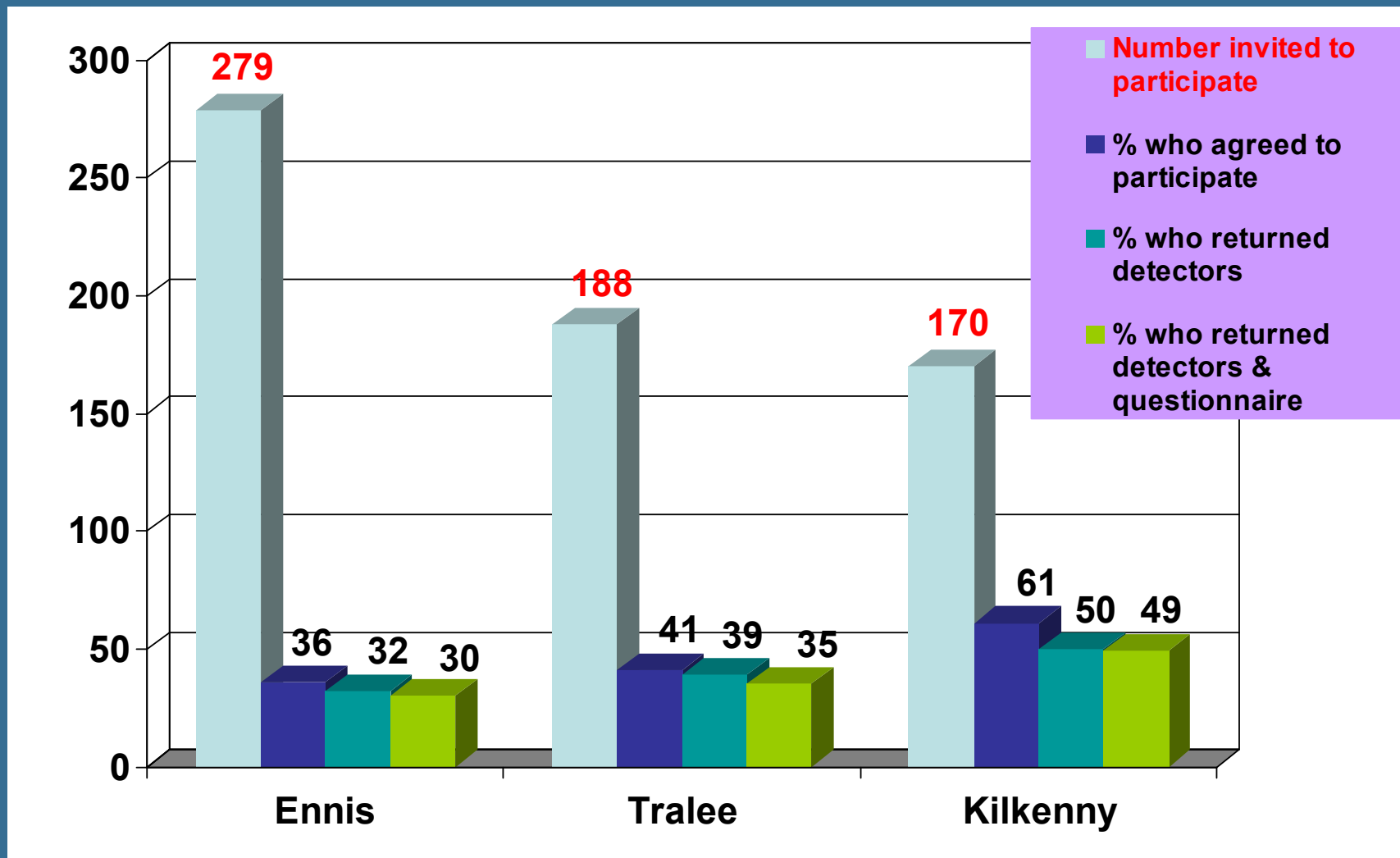


# Surveys' methodology

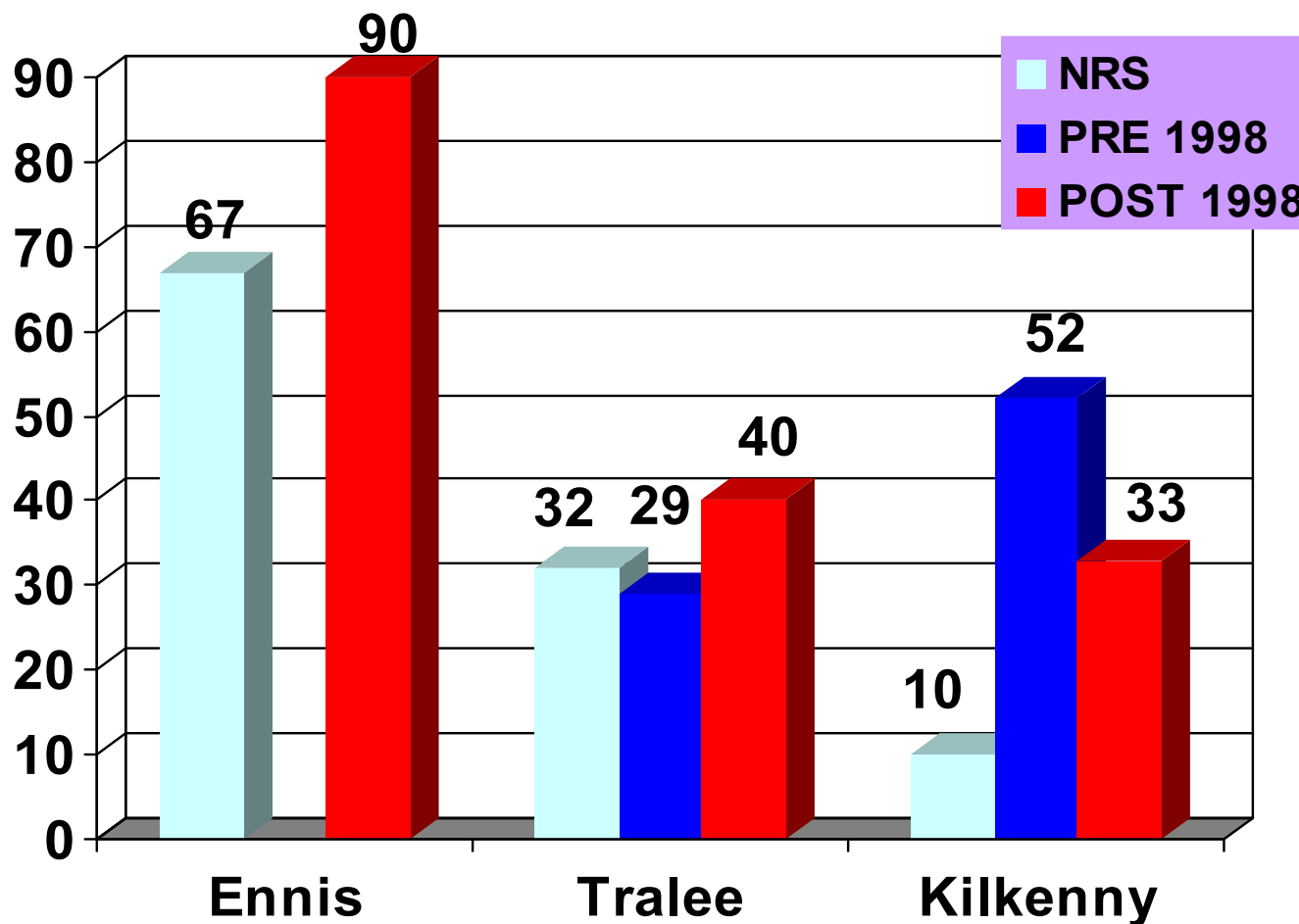
- **Commencement notices** from Clare, Kerry and Kilkenny County Councils
- Householders **invited to participate** by letter
- 3 detectors (main living area, main bedroom and ground floor) issued to **final participants** and recalled after 3 months
- **Questionnaire** seeking information on dwelling characteristics and radon preventive measures installed (awareness aspect)
- **Seasonally adjusted average radon concentration** for the building calculated
- Householders notified of the **results + advice + free post-remediation measurement available**



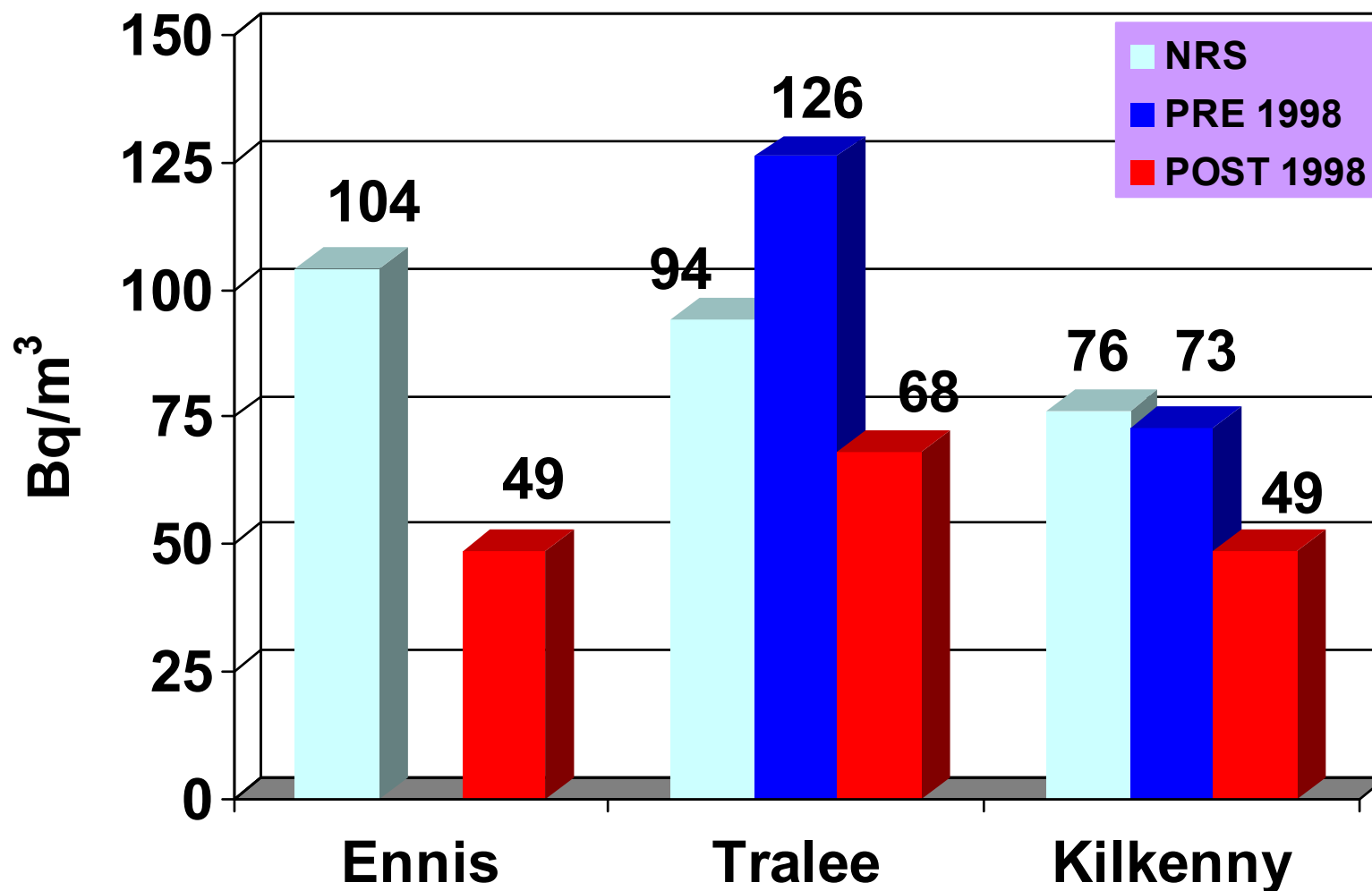
# Participation rates



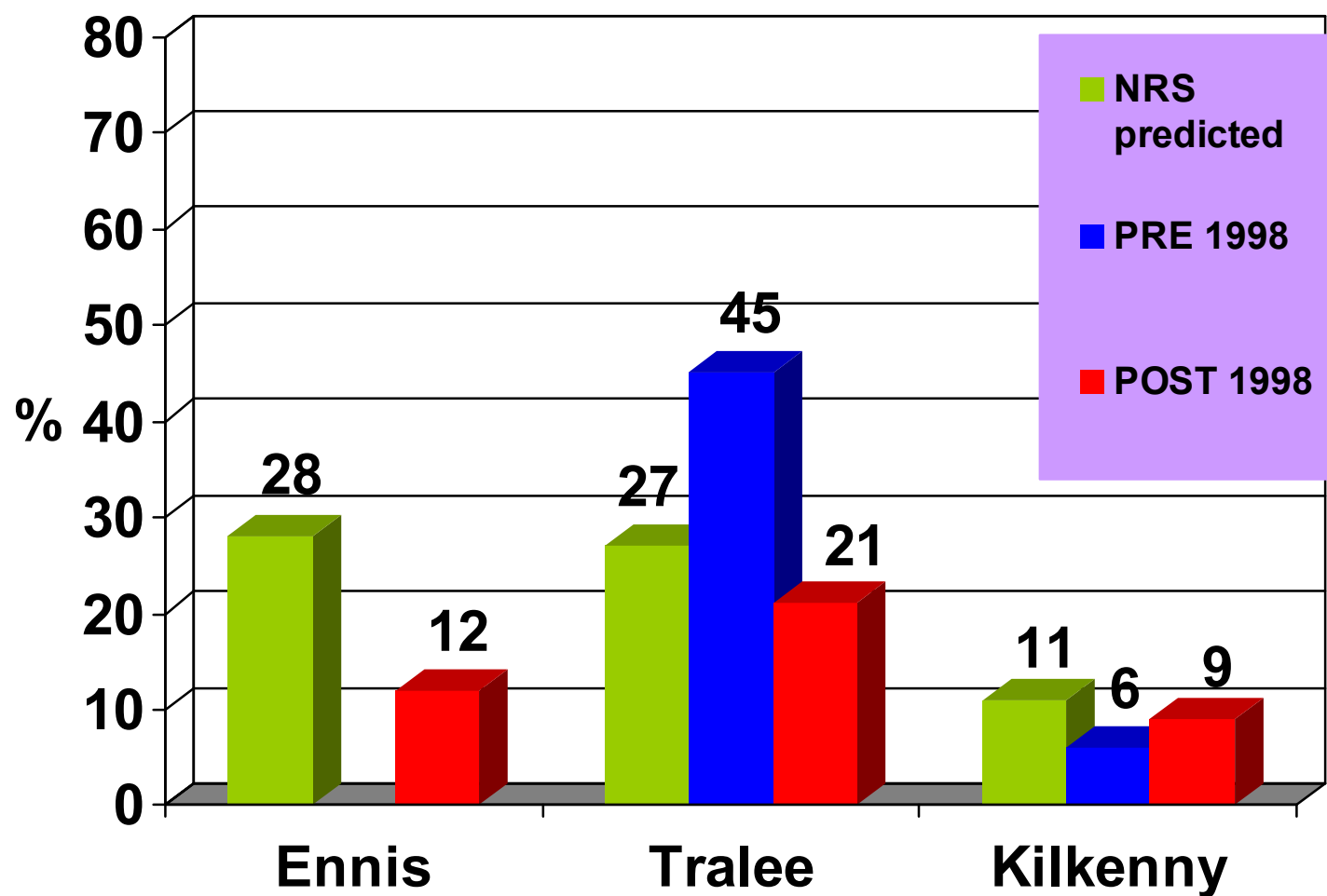
# Total number of homes measured



# Mean radon levels



# % of houses measured > 200 Bq/m<sup>3</sup> vs predicted % (NRS)



# Main conclusions from the 3 surveys

- Reduction of between 50% (Ennis and Tralee) and 30% (Kilkenny) in the mean radon concentrations
- Reduction of 50% (Ennis and Tralee) in the % of homes  $> 200 \text{ Bq/m}^3$
- Kilkenny: from 6% (Pre 1998) to 9% (Post 1998)  $\rightarrow$  increase?

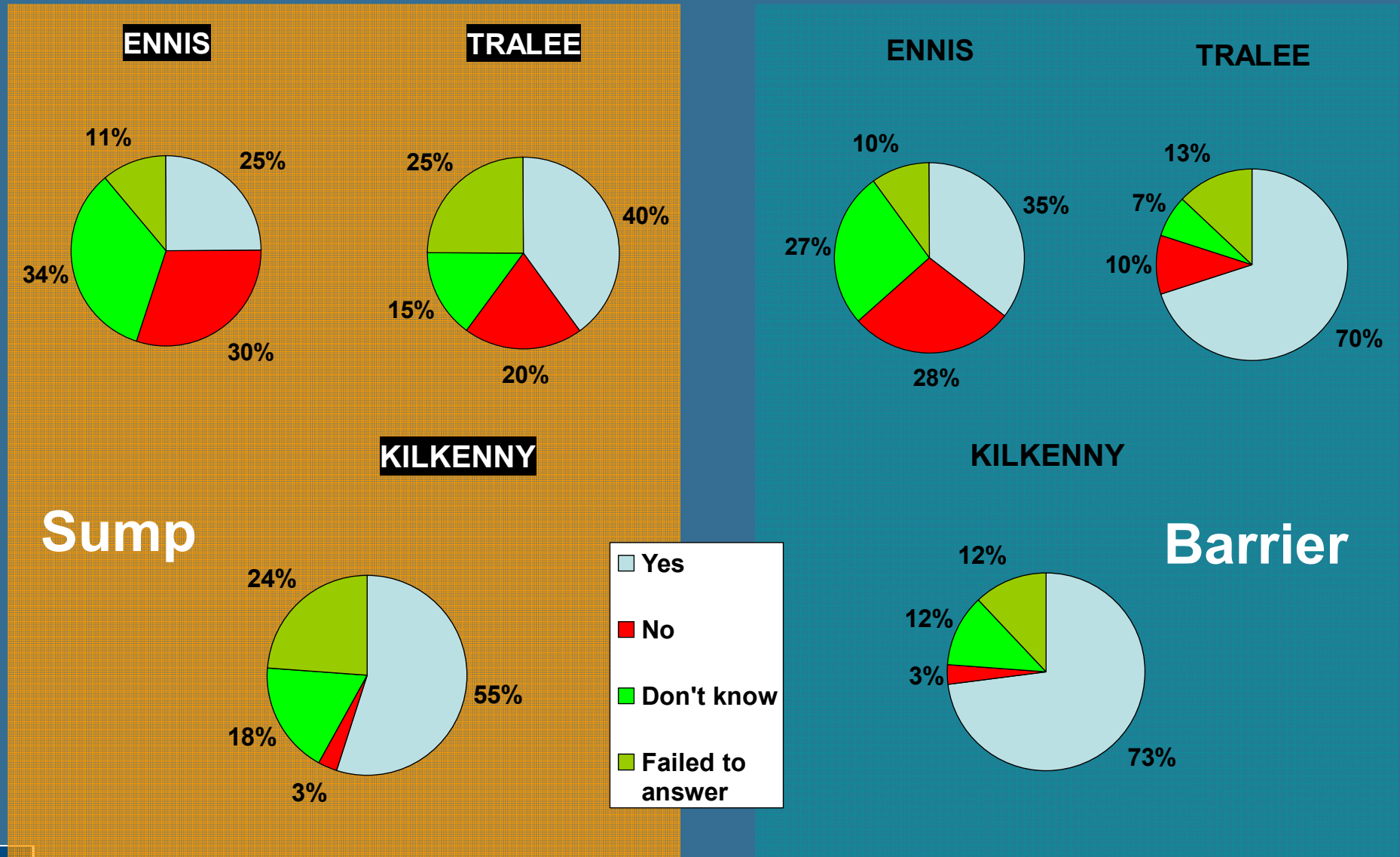


# Kilkenny Survey - Houses built after 1998

- In total, **33 houses built after 1998** were measured
- Of these, **3 (or 9%) had radon concentrations in excess of 200 Bq/m<sup>3</sup>**
- The remaining 91%: 13 to **105** Bq/m<sup>3</sup>
- From the addresses, all located in the **same locality**
  - ✘ **494** Bq/m<sup>3</sup>
  - ✘ 673 Bq/m<sup>3</sup>
  - ✘ 1567 Bq/m<sup>3</sup>
- The “**jump**” in the radon levels in the 3 high “new” houses compared with the other 30 new houses (105 up to 494 Bq/m<sup>3</sup>) **possibly indicates a problem with the integrity of the radon barrier** in these 3 homes which is not seen in the other 30 homes



# Householder awareness (for “new” homes)



# Recommendations

- **Based on results from Ennis Pilot Survey, TGD C (1997) amended → TGD C (2004)**
  - ✘ Apply to construction works commencing **on or after 1 April 2005**:
  - ✘ Ensure that radon protection measures are carried out more effectively
  - ✘ Radon proof membranes should be independently certified, carefully installed and protected from damage
  - ✘ Terminals of pipes associated with standby sumps should be capped and **clearly identified**
  - ✘ RPII Radon Prediction Maps incorporated in the new document
  - ✘ Mention the national reference level for workplaces and associated legislation



# Conclusions

- Provision of a **radon barrier** in a dwelling during construction is having beneficial effect **BUT is not a guarantee that radon concentrations will be below 200 Bq/m<sup>3</sup>** (high homes still found)
- Therefore :
  - ✘ **All new houses** once occupied **should be tested** for radon
  - ✘ **Awareness** of sump is essential as its purpose is to facilitate future remedial work if subsequently high radon levels are found (backup system in case barrier fails)
  - ✘ There seems to be a **need for general advice** aimed at new house owners (raising awareness + correct understanding is key component into achieving reduction of the risks posed by radon)
  - ✘ Advice **not only to householders...**





*Courtesy of Cork County Council*





*Courtesy of Cork County Council*



**Radiological Protection Institute of Ireland**  
An Institiúid Éireannach um Chosaint Raideolaíoch

*National Radon Forum Tralee*

20

# Future ... ?

- Repeat surveys elsewhere?
  - Increase number of participants
  - Commencement notice date is only way to know when building constructed
  - Computerised records
  - Large developments (developers' name)
  - Location
- Are barriers really / properly installed?
- Is building distribution different between early 90s and nowadays (clusters)?
- Are building techniques different?
- Will awareness increase (effect of TGD-C 2004, DoE leaflet)?



Thank you for your attention

