

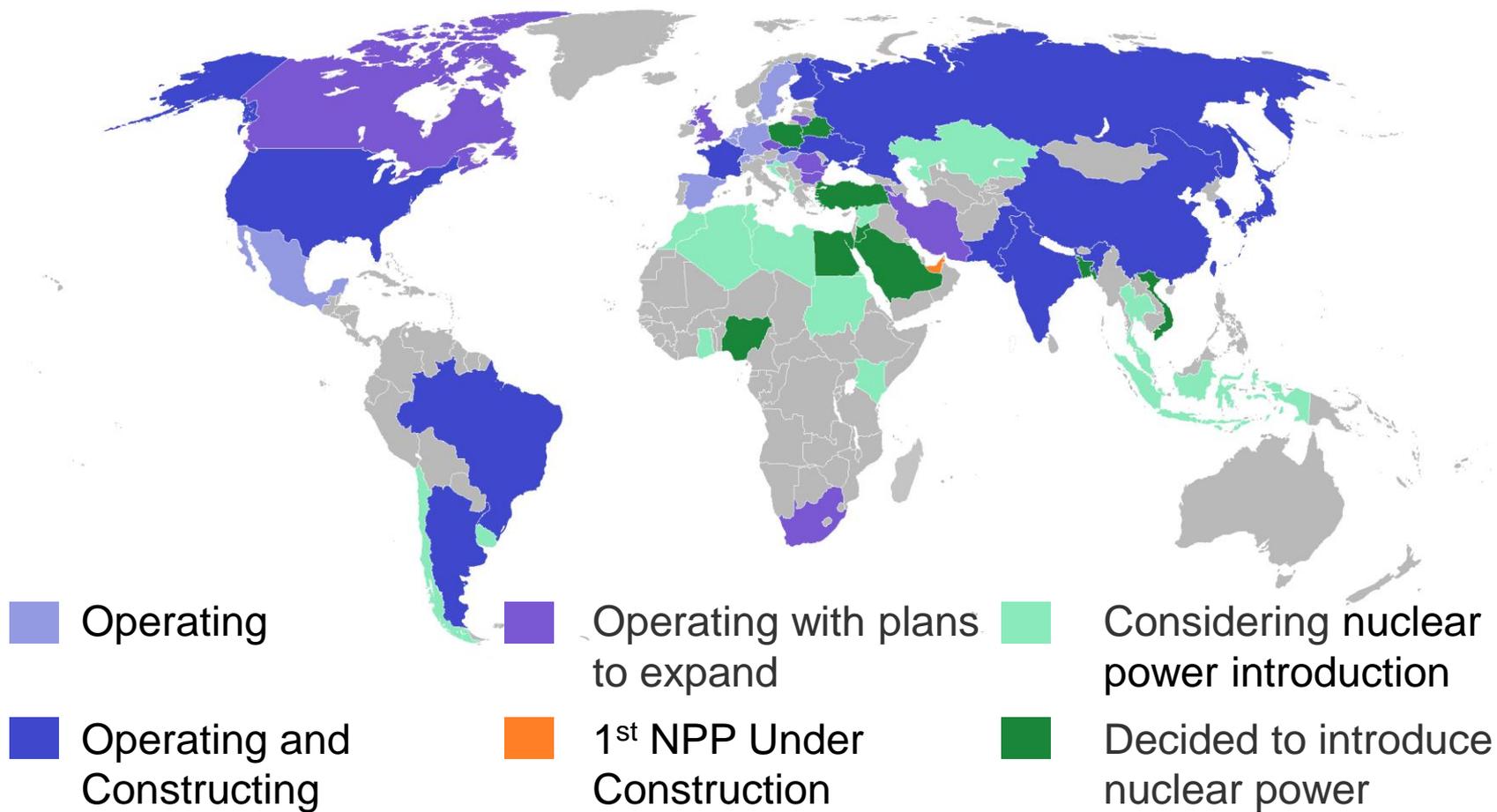
**IAEA**

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# Safe Disposal of Radioactive Waste as the Key to the Sustainable Use of Nuclear Energy

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# Nuclear energy remains an option

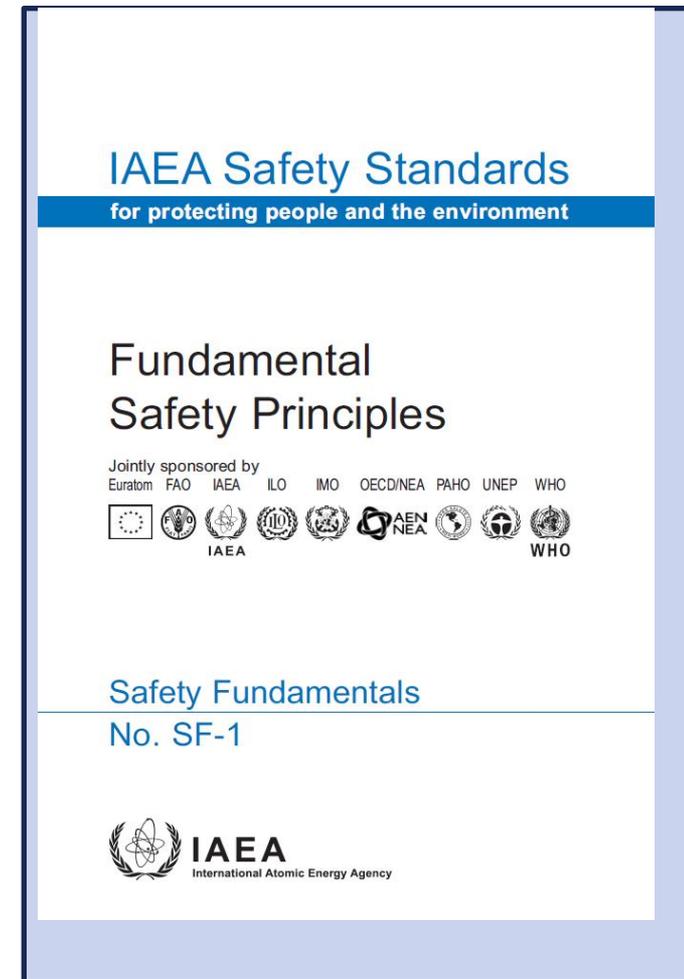


## New countries remain interested

		2010	2011	2012
<b>Phase 3</b>	First nuclear power plant started construction/ under construction	1	0	1
<b>Phase 3</b>	First nuclear power plant ordered	2	3	2
<b>Phase 2</b>	Decided to introduce nuclear power and started preparing the appropriate infrastructure	10	6	6
<b>Phase 1</b>	Active preparation for a possible nuclear power programme with no final decision	7	6	6
<b>Phase 1</b>	Considering Nuclear Power Programme	14	14	13
<b>Total</b>		<b>34</b>	<b>29</b>	<b>28</b>

# Radioactive Waste (RW) Still a Concerns

- Radioactive waste as a by-product raises numerous concerns in public
- Radioactive waste is one of main arguments against further use or expansion of nuclear energy
- Consistent RW management with primary goal to protect people and the environment from the harmful effects of ionizing radiation of high importance for the sustainability of nuclear power



# What is needed for consistent RWM?

- Adequate legislative and regulatory framework for RW and spent fuel (SF) management
- Adequate RWM system
  - Clear allocation of responsibilities for RWM
  - Necessary capabilities (facilities, human resources)
  - System for financing RWM



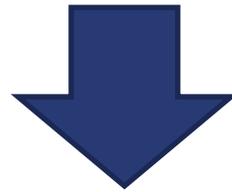
National RWM policy



RWM Strategy

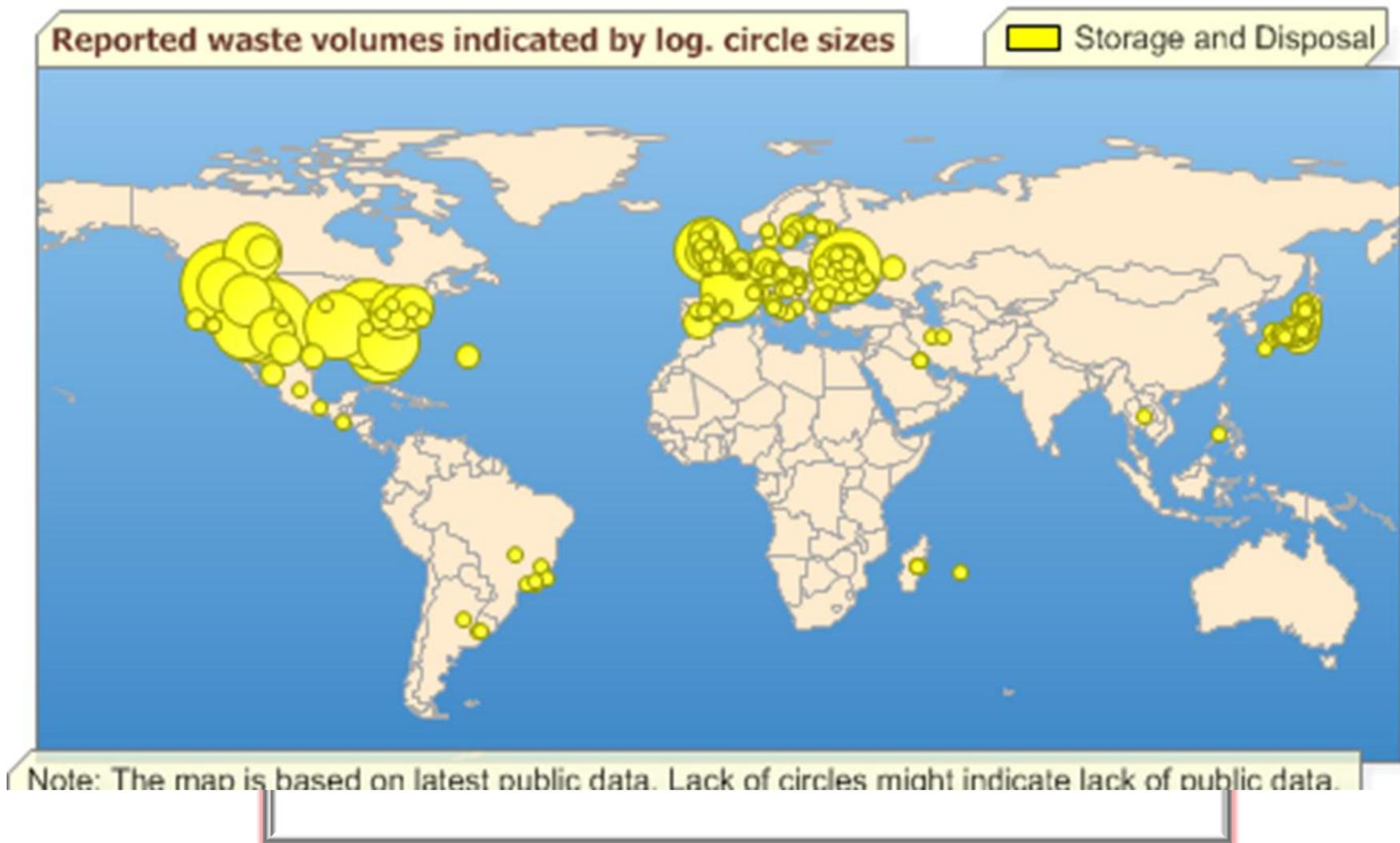
# What is needed for consistent RWM?

Clear and consistent  
implementation plan

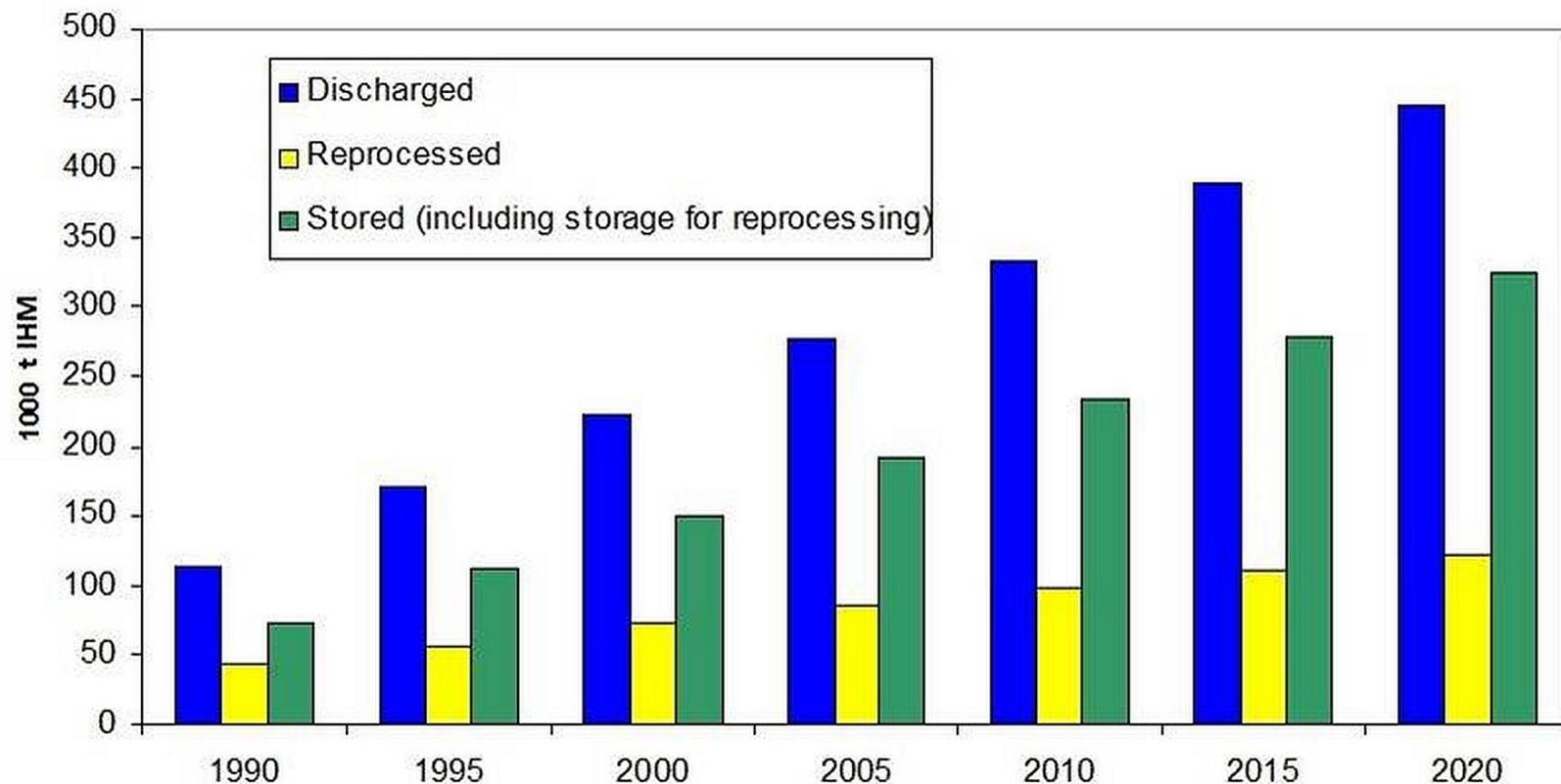


Implementation in  
consultations with public

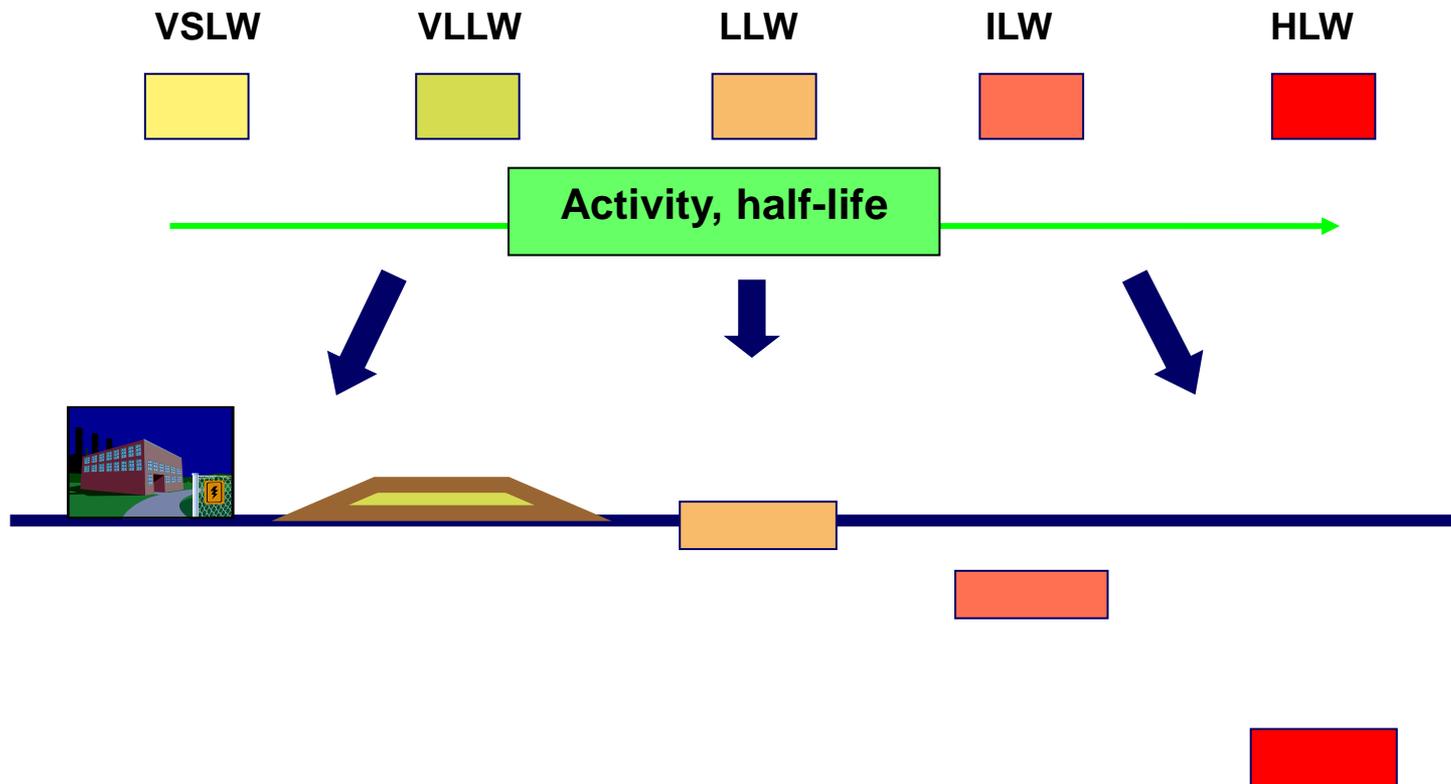
# L/IL Radioactive Waste Inventories



# Global Inventory of Spent Nuclear Fuel



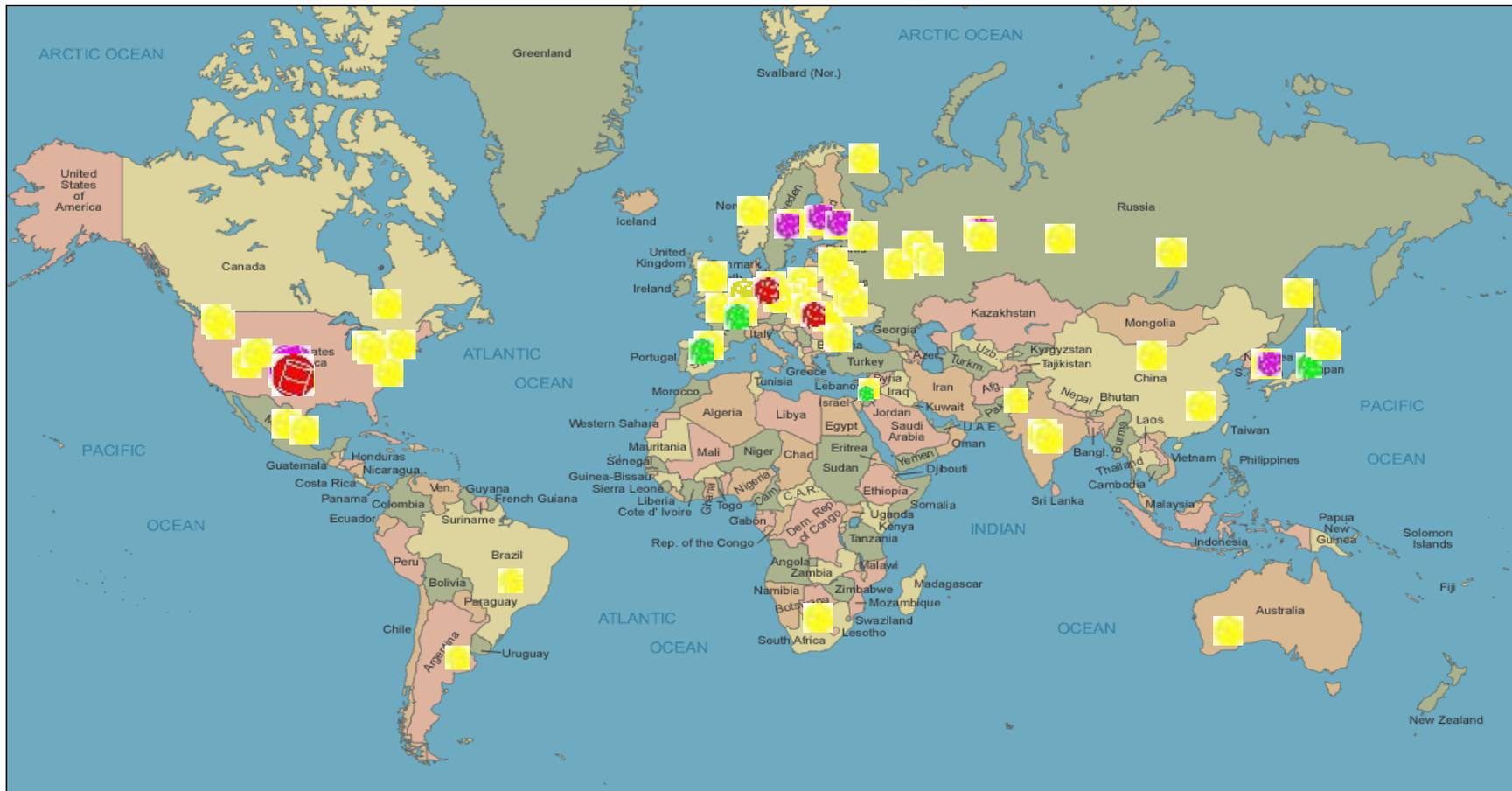
# Disposal solutions available



# How successful are we in implementing?

- Disposal of RW and SF recognized as the only final solution
- Current situation in Member States:
  - 25 countries already have repositories for L/ILW
  - First repositories for SF and HLW expected in next decade
  - In many countries still no clear policies and strategies/programmes for waste disposal
- In newcomer countries main focus on power needs and NPP construction – little consideration of spent fuel and waste management needs

# Disposal facilities for VLLW, LLW or ILW



Near Surface Repository   VLLW   LLW   ILW   Geological Repository

# Trench type disposal concepts

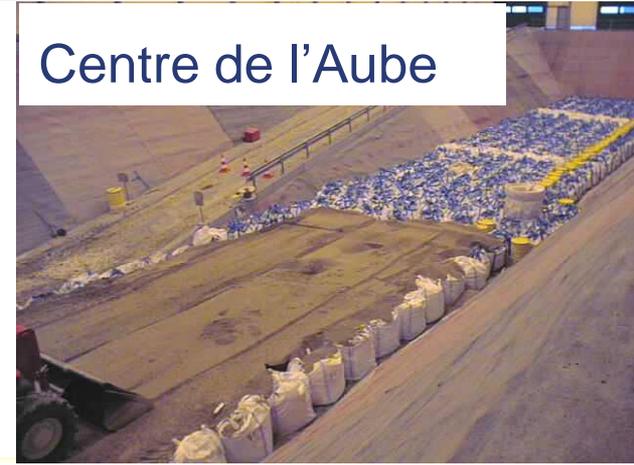
NTS - Area 5



Richland



Centre de l'Aube



Peña Blanca



Ezeiza



El Cabril



Vaalputs



# Engineered near-surface disposal concepts

La Manche



El Cabril



Mochovce



L'Aube - CSA



Dukovany

Beilong



Rokkasho



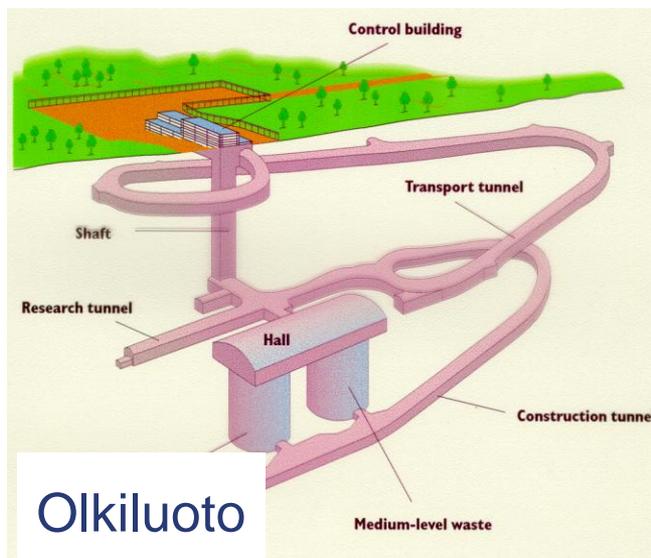
NorthWest



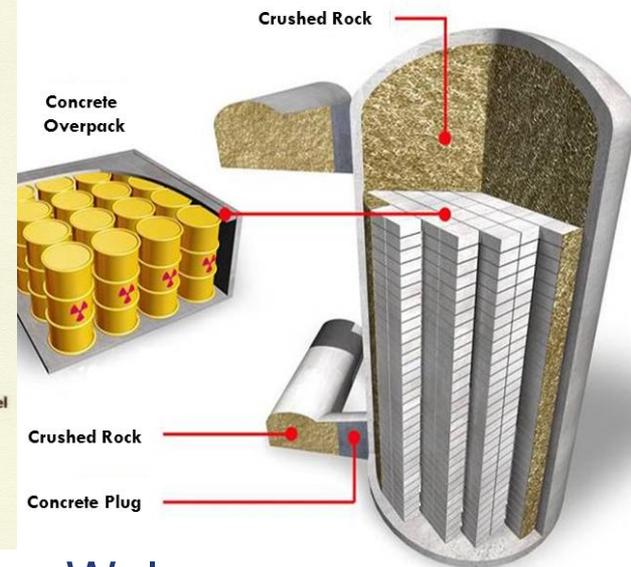
# LLW/ILW disposal in geological formations



SFR



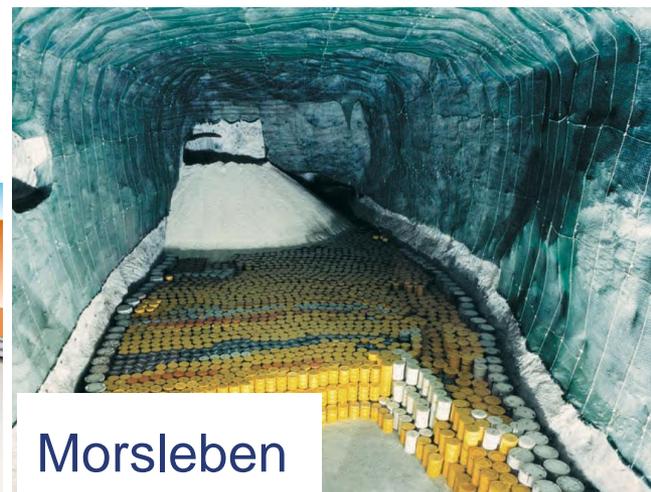
Olkiluoto



Wolsong



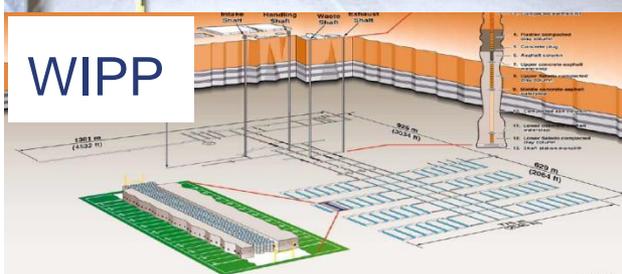
Bátaapáti



Morsleben



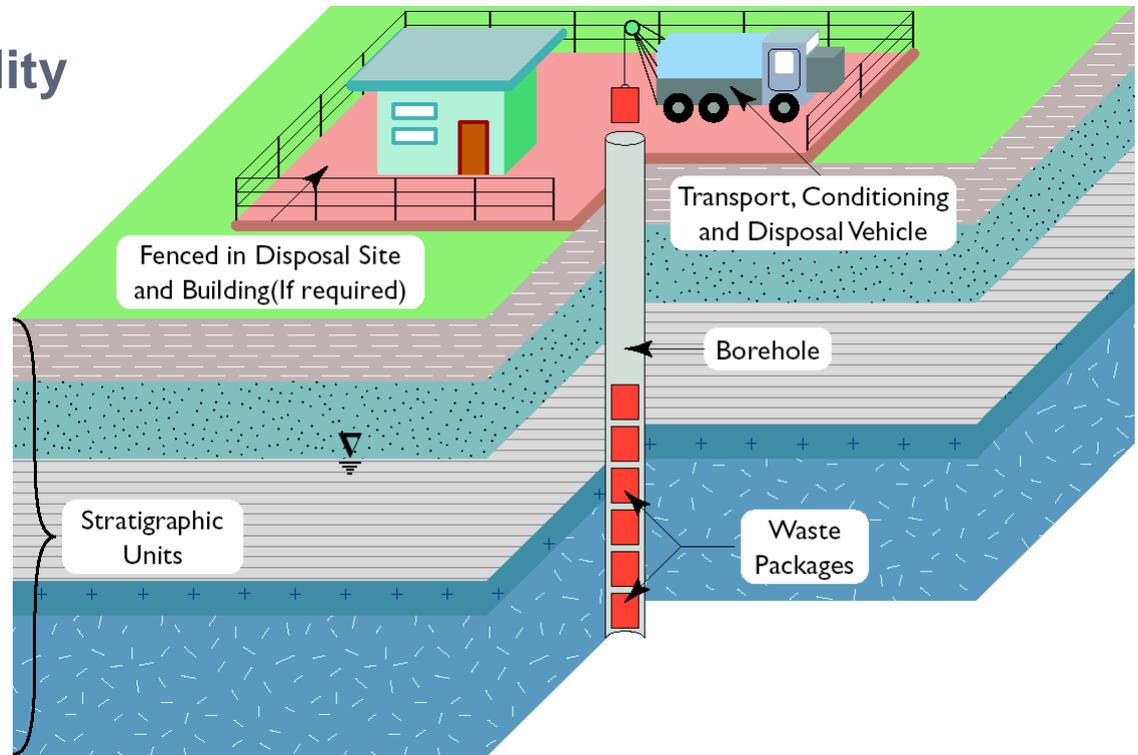
Konrad



WIPP

# Disposal for very small inventories

## Borehole Disposal Facility

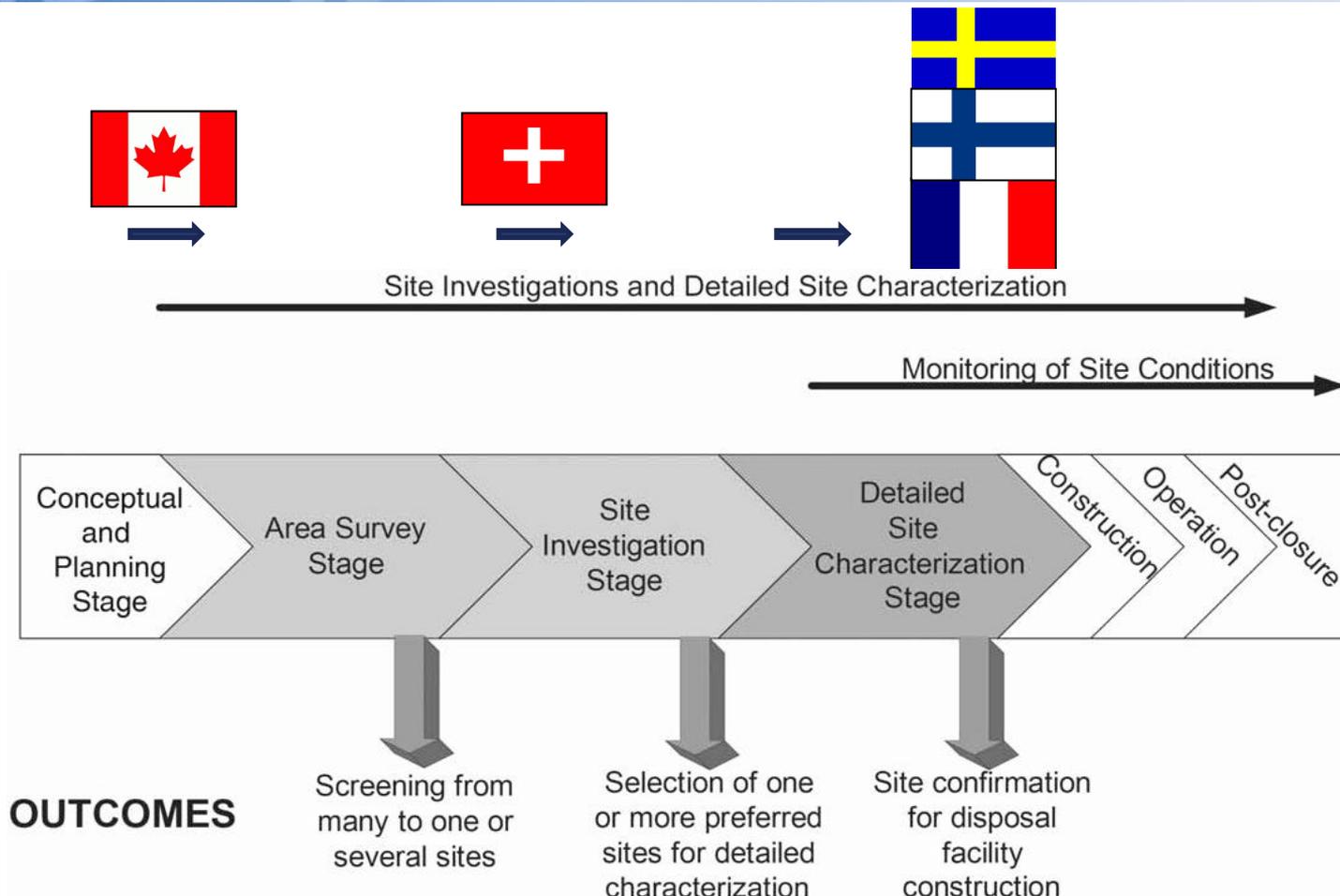


Project developments:

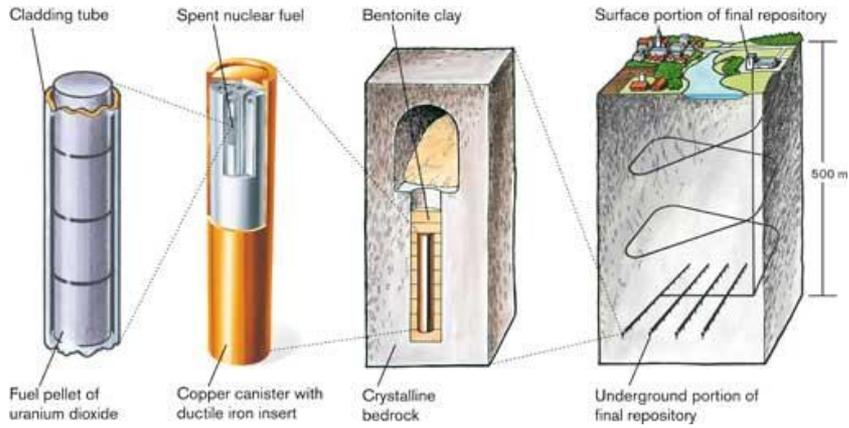
South Africa

Ghana, Malaysia,  
Philippines, Brazil...

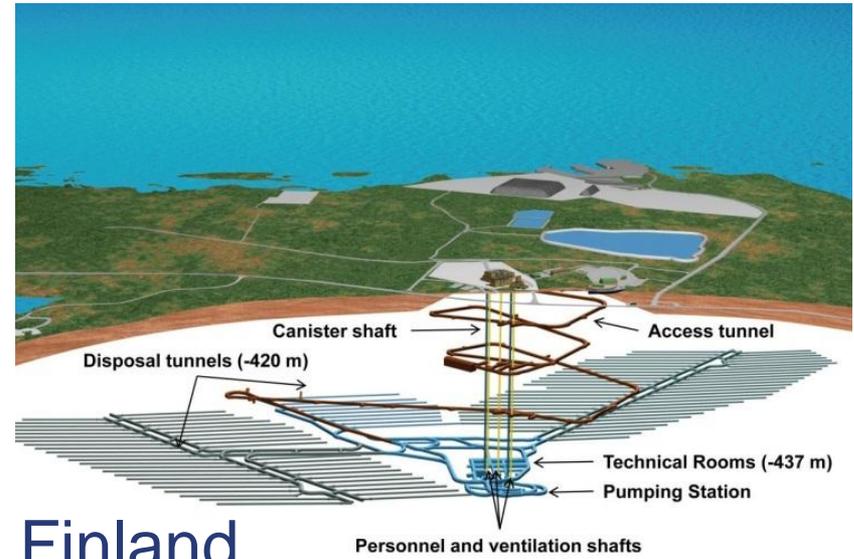
# HLW/SF Disposal



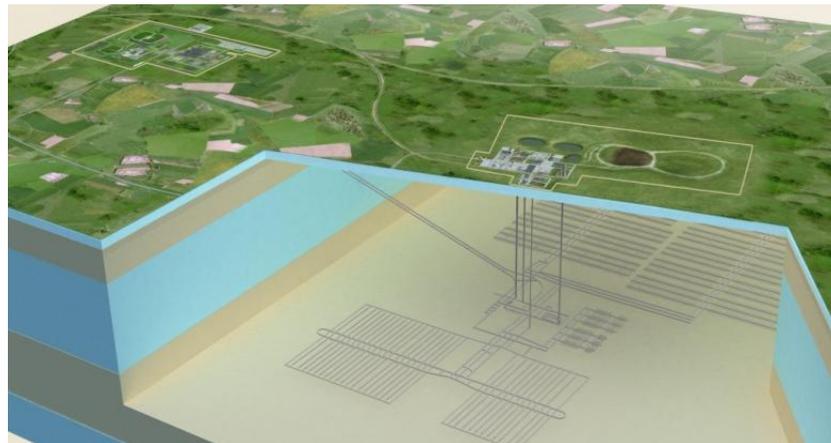
# HLW/SF disposal



## Sweden



## Finland



## France

# Addressing New Challenges

- Remediation after a nuclear accident/emergency generates very large amounts of waste (Chernobyl, Fukushima)
- Managing large volumes of waste after an emergency is unique challenge:
  - Technical solutions
  - Economic aspects
  - Public acceptance/societal issues
  - Licensing issues
  - Development of safety case
  - Timing
- Solution to this problem has strong impact on public perception

# Impact of RW Management

- Nuclear power is a complex issue that raises many concerns in public and among decision-makers
- RW management perceived as the most problematic
- Avoiding or delaying to address waste issue is contra-productive
- No easy solution → requires efforts of government(s), nuclear industry, regulators, implementors  
→ hard and consistent work over many decades

# How is IAEA Contributing?

- Encourages use of internationally agreed safety standards for RWM, decommissioning and environmental remediation
- Supports establishment of
  - national policy for RWM, decommissioning and remediation and
  - strategies for their implementation in each country using nuclear power or technology (including newcomer countries)
- Addressing specific aspects and challenges (large volumes of waste, disposal of small inventories,..)
- Supports countries in developing or strengthening their capacities/capabilities for RWM, decommissioning and environmental remediation
- Encourages and supports cooperation, sharing of knowledge and experience including lessons learned from accidents

# In Conclusion

- RWM shows significant progress and achievements but further efforts are needed to demonstrate sustainability :
  - successful implementation of SF/HLW disposal
  - Implementation of adequate RWM solutions in all countries using nuclear technologies
- Crucial for success:
  - Nuclear industry needs to demonstrate its maturity by due care of liabilities including SF and RWM
  - Political commitment and stable support
  - Transparent and dedicated work of implementers
- New challenges in RWM (large volumes of waste after an emergency, disposal of small inventories, newcomer countries..) need to be adequately addressed

# In Conclusion

- IAEA urges all advanced programmes to continue:
  - Sharing information and knowledge with less advanced programmes and international community
  - Supporting the IAEA in its efforts to assist countries lacking disposal solutions
- IAEA ready to assist Member States in:
  - building RWM infrastructure
  - implementing disposal solutions
  - addressing new challenges