

## 1 WHAT IS AT STAKE ?

Lessons learned by IRSN from its analysis of significant events involving the transport of radioactive materials for civilian purposes in France. This report is published every two years and covers events reported during 2012 and 2013.



**980,000**

PACKAGES OF RADIOACTIVE MATERIALS FOR CIVILIAN USE TRANSPORTED EACH YEAR IN FRANCE



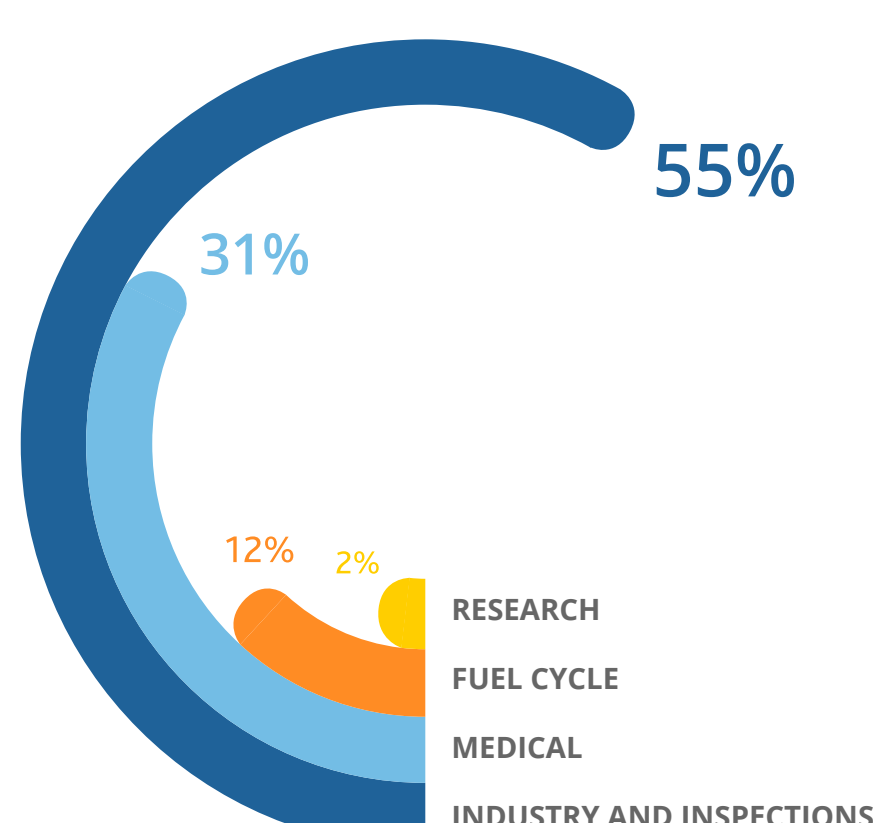
**15 MILLIONS**

HAZARDOUS MATERIAL PACKAGES TRANSPORTED EACH YEAR IN FRANCE

All radioactive material for civilian use transport operations are covered by international regulations that are implemented in the form of regulatory mechanisms specific to each mode of transport: road, railway, inland waterway, sea or air.

The transport involves a wide variety of substances, physical and chemical forms, radioactivity quantities and types of packaging. A package can range from 10 centimetres to 8 metres in length and its weight can vary between a few kilograms and more than 100 tonnes.

SHIPMENTS BY SECTOR OF ACTIVITY



## FACTORS TAKEN INTO ACCOUNT BY IRSN TO ACHIEVE ITS OVERALL ASSESSMENT

Assessment is performed using data of 'significant events' that consignors of packages containing radioactive materials are required to report to the French Nuclear Safety Authority (ASN). ASN classifies each event on the "International Nuclear and radiological Event scale" (INES) which consists of seven levels.

### REGULATION AND NOTIFICATION CRITERIA



#### REGULATION

This covers all events that occur during the course of the transport itself or during the loading, unloading or inspections of packages before and after transport on public roads.



#### SIGNIFICANT EVENTS

Transport-related events covered by one of the 13 criteria defined by ASN in the guide to the reporting of significant events.



#### SAFETY-RELEVANT EVENTS

Some operators declare events to ASN that are not covered by criteria. They are referred to as "safety-relevant" events.

### LEVEL ON INES SCALE



#### LEVELS 0 AND 1

##### Deviations and anomalies

In France, about fifty events each year. The number of anomalies (Level 1) has reduced since the beginning of the 2000s.



#### LEVELS 2

##### Incidents

In France, only one case recorded in the last 14 years (between 1999 and 2013).



#### LEVELS 3-7

##### Serious incidents and accidents

In France, only one serious incident (Level 3) in 2001.

## 2 ANALYSIS OF TRANSPORT-RELATED EVENTS IN 2012 AND 2013

Approximately a hundred events are reported each year. In 2012 as in 2013, the number of events has not changed significantly compared with previous years. None of these events had significant radiological consequences for the workers, the population or the environment.



**1**

EVENT DECLARED ON AVERAGE PER 10,000 PACKAGES TRANSPORTED

On average, there are 1 event per 1,900 packages transported in fuel cycle sector, 1/5,600 packages in the research sector, 1/9,600 packages in the medical sector and 1/72,000 packages in the industry and technical inspections sector.

NUMBER OF EVENTS DECLARED PER YEAR



### EVENTS IN 2012 AND 2013

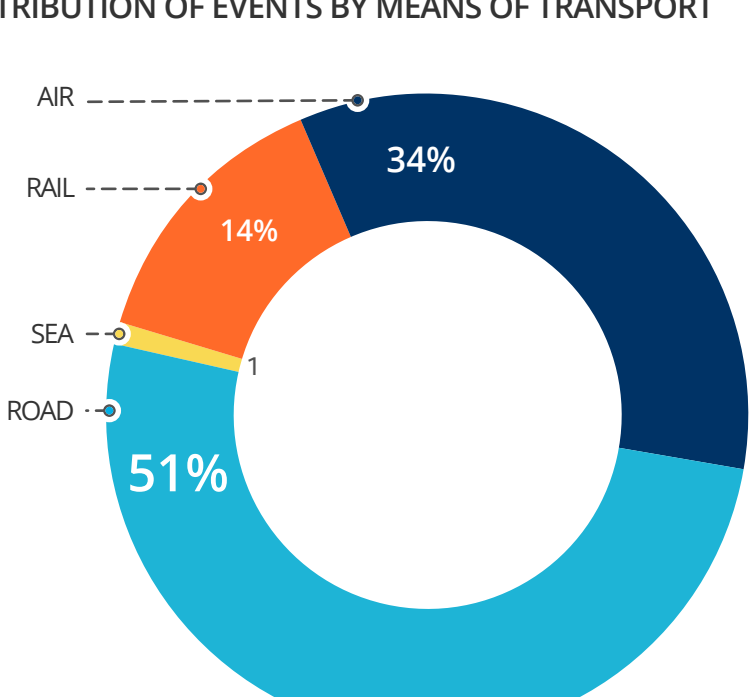
The fuel cycle sector represents most of the declared events, with an average of around sixty events per year.

This is followed by the medical sector with approximately thirty events per year, then by the industry and technical inspections sector, with less than ten events declared each year, and lastly the research sector with an average of around four events per year.

The number of events concerning the industrial and technical inspections sector may seem low. Analysis leads us to believe that the event identification and reporting methods of the consignors and carriers are not as efficient as those of the nuclear fuel cycle sector stakeholders.

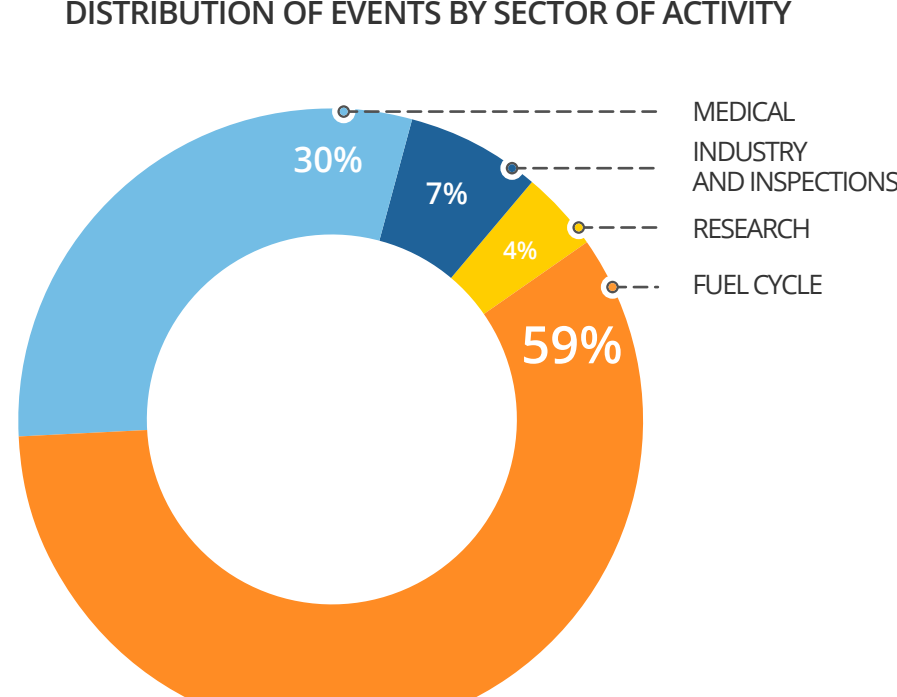
### DISTRIBUTION OF EVENTS IN 2012 AND 2013

DISTRIBUTION OF EVENTS BY MEANS OF TRANSPORT



If approximately 95% of the packages are transported solely by road, just over 50% of events concern road transport.

DISTRIBUTION OF EVENTS BY SECTOR OF ACTIVITY

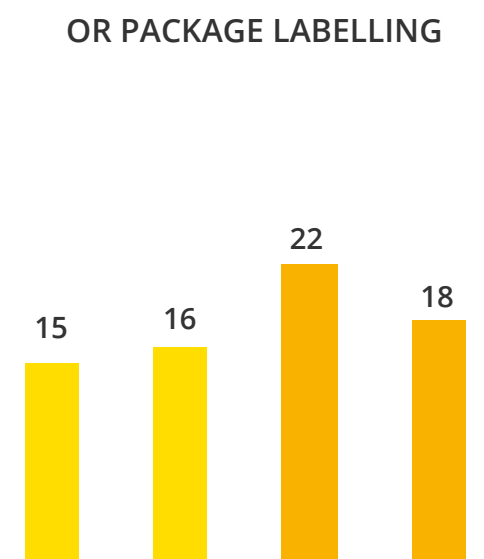


In 2012 and 2013, the fuel cycle sector represents only 12% of the number of packages but approximately 60% of transport-related events reported.

## PROPOSALS FOR IMPROVEMENTS

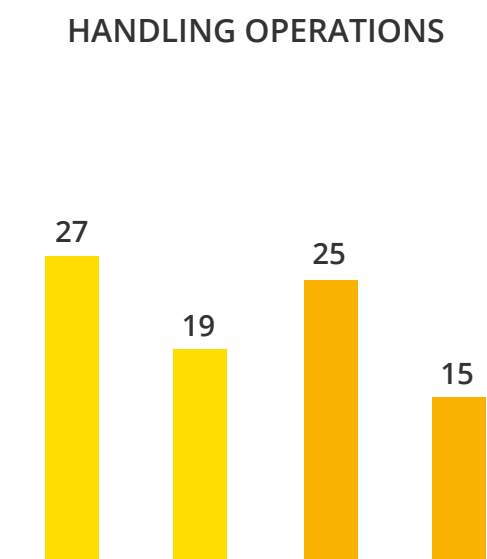
This in-depth analysis by IRSN is critical to identifying the possible recurring or generic causes of the events and to defining more relevant corrective actions that can improve safety. The lessons learned provide IRSN with additional feedback that increases transport safety by improving the casks, operating practices or regulations.

#### MISSING OR ERRORS IN DOCUMENTS OR PACKAGE LABELLING



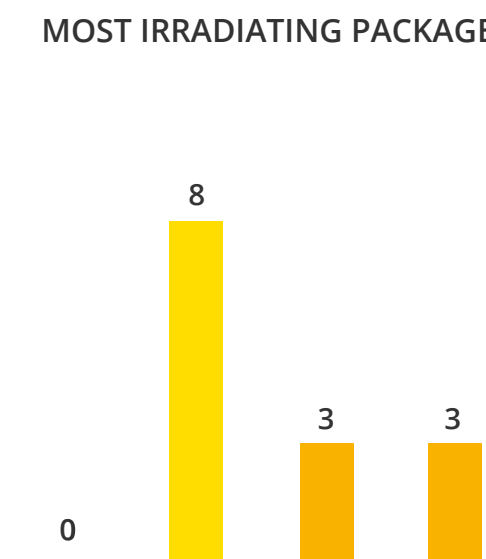
Increase awareness and provide regular training for operators in charge of radiation protection and checking shipping documents and labelling.

#### PACKAGE DAMAGE CAUSED DURING HANDLING OPERATIONS



Continue awareness-raising actions directed to airlines and companies performing airport handling operations, that are the most frequently involved in this type of event.

#### DEFECT IN THE CLOSURE OF THE MOST IRRADIATING PACKAGE



Enforce the operating instructions for setting the bolts and tightening them in the closure of the irradiated fuel assembly packaging.

