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DI INGEGNERIA CIVILE
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DEVELOPMENT OF A TRANSNATIONAL ACCIDENT PREDICTION MODEL

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MINISTRY
OF INFRASTRUCTURE
AND CONSTRUCTION



Instytut Badawczy
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The PRACT project is aimed at **developing a practical guideline and a user friendly tool** that will allow the different road administrations to:

- **adapt the basic APM function to local conditions** based on historical data;
- **identify the CMFs that could be relevant** for the specific application;
- **verify if the selected CMFs are transferable** to the specific condition;
- **apply the calibrated model** to the specific location to be analysed.

WP0 – Project Management
Francesca La Torre (UNIFI)

WP1 – Overview of existing APMs and data sources
George Yannis (NTUA)

TK 1.1
Inventory and critical review of existing APMs (NTUA)

TK 1.2
Inventory of existing Data Sources (TUB)

WP2 – Identification and prioritisation of CMF needs
Daniel Graham (ICL)

TK 2.1
Inventory and critical review of available CMFs (TUB)

TK 2.2
Identification of CMF needs (UNIFI)

TK 2.3
Development of key missing CMFs (ICL)

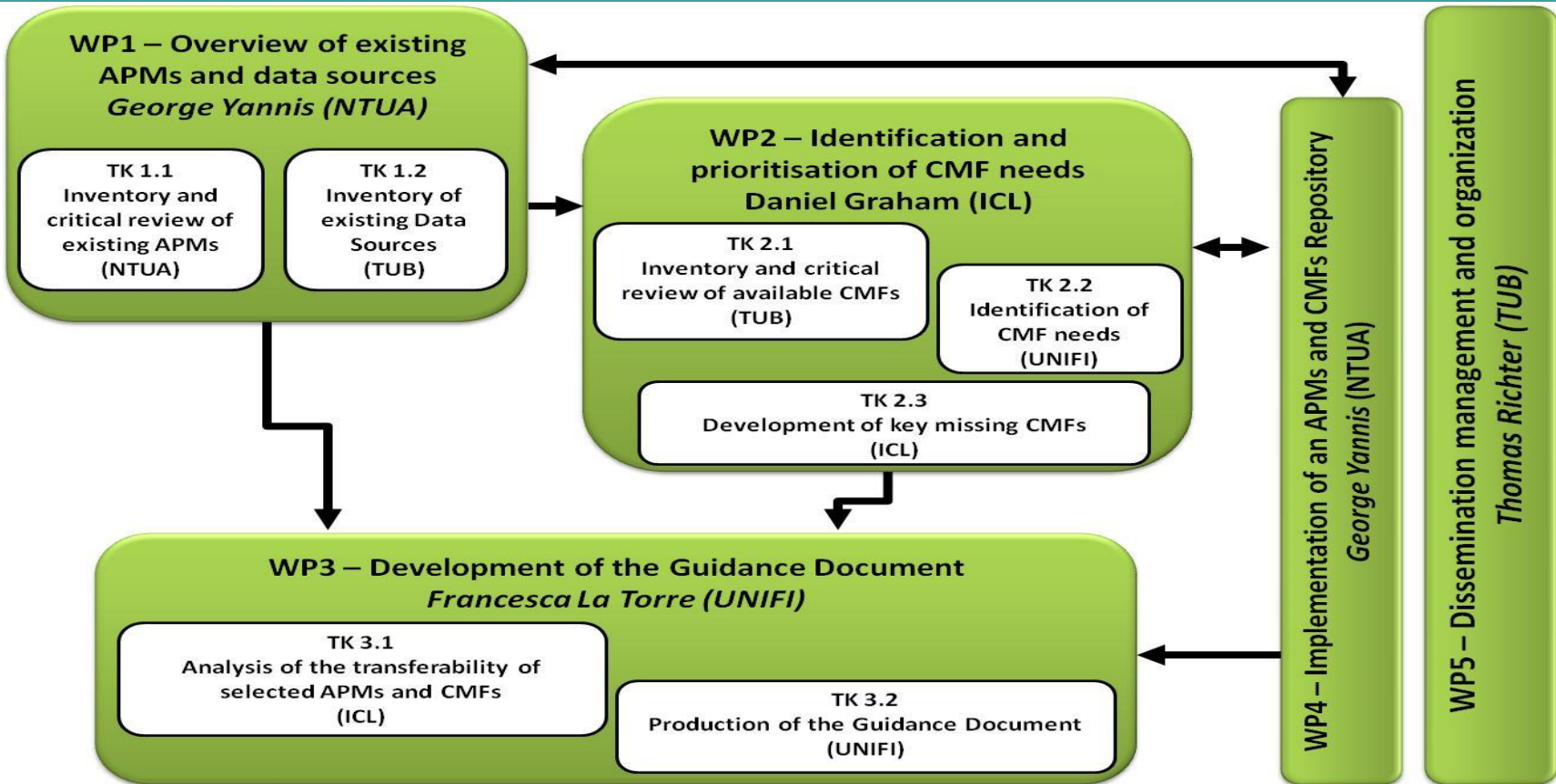
WP4 – Implementation of an APMs and CMFs Repository
George Yannis (NTUA)

WP3 – Development of the Guidance Document
Francesca La Torre (UNIFI)

TK 3.1
Analysis of the transferability of selected APMs and CMFs (ICL)

TK 3.2
Production of the Guidance Document (UNIFI)

WP5 – Dissemination management and organization
Thomas Richter (TUB)



The modeling approach

Accident Prediction Model (APM) = a full model that allows an evaluation of the predicted number of crashes in a given condition

Safety performance function
(full APM)

Base APM x CMFs x C

- In the inquiry phase we investigated both and these were all collected in the web repository;
- The PRACT Model is based on the second approach.

The modeling approach

- the idea that a unique Accident Prediction Model (APM) model and unique set of Crash Modification Factors (CMFs) can actually be developed, valid for all Europe and for all the different type of networks of motorways and higher ranked rural roads, is unrealistic;
- the development of a specific APM model and a set of CMFs based on local data is extremely time consuming and expensive and requires data and experience that most road administrations do not have;
- the development of “local” CMFs only based on historical local data prevents the possibility of evaluating the effectiveness of new technologies.

The progressive application approach

TRANSPORT RESEARCH ARENA

As far as different countries, as well as different designers within a country, have different level of expertise and different data availability, the system need to be structured with different possible application levels.

Very detailed data available



Full PRACT Calibration
(base APM and overall model)

Some data available



Reduced PRACT Calibration procedure
(only overall model)

No data available



Default selection criteria
(different sets)

The Predictive Model

$$N_{pred_calib} = C \times N_{spf} \times CMF_1 \times CMF_2 \times CMF_3 \dots$$

N_{pred_calib} = **predicted average crash frequency** (crashes/yr)

N_{spf} = **predicted average crash frequency of a site with base conditions** (crashes/yr)

CMF_i = **crash modification factors** specific to the site type, cross section, crash type, and severity analysed

C = **calibration factor** to adjust SPF for local conditions

The Predictive Model

$$N_{\text{pred_calib}} = C \times N_{\text{spf}} \times \text{CMF}_1 \times \text{CMF}_2 \times \text{CMF}_3 \dots$$

SPF base

$$N_{\text{spf}} = L \times \exp [a + b \times \ln (c \times \text{AADT})]$$

SPF developed for base conditions

The Predictive Model

In order to obtain reliable results in using the predictive models

Development of Local SPF for Use in the Predictive Method

Use of a SPF Developed for Different Local Conditions (HSM, PRACT)

Calibration of Predictive Models

DATA COLLECTION & MODEL FITTING

COUNTRY	Number of Analysis Years	Segments		Number of Fatal Injury Accidents		
		Number	Total Length [km]	SV	MV	TOT
GERMANY	5	1863	1093	716	1312	2028
GREECE	5	95	83	22	30	52
ITALY	5	884	884	1061	1904	2965
NETHERLANDS	3	981	786	105	138	243
UNITED KINGDOM	5	122	153	129	468	597

Situation 1: a CMF estimate θ is available in the literature from another jurisdiction. Some descriptive statistics for key characteristics of the road network used in its estimation are also available.

Situation 2: A CMF estimate θ is available in the literature that has been estimated on **conditions different from local conditions (or for unknown conditions)**.

The treatment has already been implemented in “n” road segments in his local area. He has available data on accident rates on these segments before the treatment (X_1, X_2, \dots, X_n) and after the treatment was implemented (X_1', X_2', \dots, X_n').

Situation 3: “n” CMFs are available in the literature (CMF_1, CMF_2,...,CMF_n). No information or local data are available to test whether these are applicable to the practitioner’s local area – combine with Meta Analysis

CEDR Transnational Road Research Programme Call 2013: Safety

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and Netherlands



Freeways

Two-lane two-ways roads

AMF/CMF Repository (web link)



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ABOUT PRACT – PREDICTING ROAD ACCIDENTS – A TRANSFERABLE METHODOLOGY ACROSS EUROPE

This Repository contains the most recent Accident Prediction Models and Crash Modification Factors, highlighting effectiveness of road safety measures worldwide, for use by road safety decision makers and practitioners worldwide.

This Repository has been developed within the framework of the project PRACT, (Predicting Road ACCidents-a Transferable methodology across Europe) carried out by the University of Florence, the National Technical University of Athens, the Technical University of Berlin and the Imperial College London, commissioned by the Conference of European Directors of Roads.

The basic assumption on which the PRACT Repository is built is that Accident Prediction Models (APM) and Crash Modification Factors (CMF) can be transferred to conditions different from the ones for which they have been developed, if selected based on scientifically valid criteria and adapted to local conditions based on historical crash data.



Predicting Road **AC**cidents - a Transferable methodology across Europe

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PRACT (Predicting Road **AC**cidents - a Transferable methodology across Europe) is a project funded by the National Road Authorities of Germany, Ireland, UK and Netherlands within the Conference of European Directors of Roads (CEDR) 2013 Transnational Research Programme - Safety.

The project aims at developing a European accident prediction model structure for motorways and higher ranked rural roads that could be applied to different European road networks with proper calibration. An important product of the PRACT project will be the establishment of a European Accidents Prediction Models (APMs) and Crash Modification Factors (CMFs) web repository with an open access database and guidance for their application and transferability on the European road networks.

[Impressum](#)

www.practproject.eu



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The National Centre
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CONCLUSIONS

- A Trans-European Accident Prediction Model has been developed with a single structure and different parameters for different countries. The model has been fitted to data from 5 Countries (Italy, UK, Greece, Netherlands, Germany)
- The model is structured with different possible levels of application to allow for a broad range of uses;
- A user friendly tool is being developed and will be available for applying APMs to local conditions;
- A procedure to check the transferability of CMFs has been developed;
- A CMF and APM Repository has been developed and is available on line.

Thank you

www.practproject.eu

