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**SCIENTIFIC INDICATORS OF CONFIDENCE IN JUSTICE:
TOOLS FOR POLICY ASSESSMENT**

<u>Work Package 3:</u>	JUSTIS Methodology: conceptualisation of new and improved indicators of public confidence in justice
<u>Task 3.3:</u>	Conceptualisation of effective and clear presentation of indicators
<u>Deliverable3.2:</u>	Instructions for developing effective presentational tools for the new indicators of public confidence in justice

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EXECUTIVE SUMMARY

The research project JUSTIS (Scientific Indicators of Confidence in JUSTIS: Tools for Policy Assessment), which is funded primarily by the European Commission from the 7th Framework Programme for Research, is designed to provide EU institutions and Member States with new indicators for assessing public confidence in justice.

This deliverable is concerned with finding the best tools for presenting complex concepts and numerical indicators in ways that will engage the imaginations of non-specialists – for example using graphical-based tools such as spider-grams.

1. INTRODUCTION

Work Package 3 provides the theoretical foundations to guide the development of new social indicators of public trust in justice and the legitimacy of legal authorities (referred in this document as 'confidence in trust' for ease of reference). Work Package 3 defines the constituent elements of confidence in justice, identifies the indicators and sub-indicators needed for a balanced comprehensive basket of level 1 and level 2 indicators, and highlights country-based contextual data that will stress local specificities and help interpret level 1 and level 2 indicators.

Importantly, these indicators need to be presented in ways that render complex concepts and numerical indicators transparent and accessible to specialists and non-specialists alike. To this end, the current deliverable establishes some firm guidelines for the presentation of the results of the indicators of public confidence in a clear and intuitive way, by way of a combination of spider-grams, diagrams and synthesis reports.

Conceptualization of effective and clear presentation of indicators

This document describes the tasks of presentation required for the main outputs of the JUSTIS project. It prescribes a "house style" for the tables and plots for the main publications of the project itself. More broadly, it discusses some general principles of effective and informative presentation of the kinds of indicators produced by the project.

We consider indicators that are specified for aggregates such as countries or groups of countries. These may be "level 3" indicators which are defined at the level of a country in the first place, or country-level aggregates (such as means and proportions) of "level 1" or "level 2" indicators that are originally collected for individuals.

We also consider "country-oriented" analyses where the aim is to describe and compare countries in terms of their values of one or more indicators. This contrasts with "variable-oriented" analyses which examine the relationships of different indicators among countries or individuals. Common examples of variable-oriented methods of presentation are the scatter plot of the values of two variables against each other, and the time series line plot of how the values of an indicator vary over time. They will not be discussed in this note, where the focus is on simple, descriptive, country-oriented presentations.

Two broad tasks of presentation will be considered separately:

- Presentation of the values of one indicator at a time. This is discussed in

Section 2.

- Presentation of several indicators at once, focusing on the profile of their values considered together. This is discussed in Section 3.

The methods of presentation will be illustrated using two examples. These are not from the JUSTIS project itself – for which the data are not yet available – but similar in type (and in some cases also in content) to the kinds of indicators which will be proposed by the project.

Example 1: Survey measures of worry about crime

Round 3 of the European Social Survey (ESS 2008), which was carried out in 2006-7, included four new questions on worry about crime among the respondents. There were questions on two types of crime, burglary and violent crime, and on each of these, one question on frequency of worry and one on its effect on the respondent's quality of life. Here we consider a single variable which combines these four questions. It was obtained using latent class analysis (Jackson and Kuha 2010), and has six levels (classes). Broadly speaking, class 1 consists of individuals who are completely unworried about crime, classes 2 and 3 of those who worry only about burglary or violent crime respectively, and classes 4, 5, and 6 correspond to respondents who worry about both types of crime, with the frequency and effect of worry increasing from class 4 to class 6. We will use aggregates of this measure for 23 European countries in Section 2 to illustrate graphs and tables for single variables.

Example 2: Country-level indicators of development

We consider data for 83 countries on the following seven international indices of various aspects of development:

- HDI: Human Development Index 2000 (provided by the U.N. Development Programme)
- ESI: Environmental Sustainability Index 2002 (World Economic Forum and others)
- WPI: Water Poverty Index 2002 (UK Centre for Ecology and Hydrology)
- POL: A combined polity score 2000, indicating the level of democracy vs. autocracy of a country's political system (Polity IV Project, Center for International Development and Conflict Management, University of Maryland.)
- IEF: Index of Economic Freedom 2003 (The Heritage Foundation and the Wall Street Journal)
- CPI: Corruption Perceptions Index 2002 (Transparency International)
- PFI: Press Freedom Index 2002 (Reporters Without Borders)

Some of these are used with scales reversed, so that all are defined so that

large values of the index correspond to high levels of development. These indices will be used in Section 3 to illustrate the presentation of several indicators at once.

The tabular and graphical methods of presentation considered here are conventional and can mostly be created with standard word processing, spreadsheet or statistical software. The plots in this report were created using the R system for statistical computation, except for the maps in Figures 2 and 5 which were drawn using the ArcMap 9.3 software.

2. PRESENTATION OF SINGLE INDICATORS

A basic task of presentation is displaying the values of one cross-national indicator for a set of countries, in a way which allows easy comparisons of the level of the indicator between the countries. The values of the single indicator may be given in one of two main forms:

- A single number, for example the average of the values of the indicator over individuals in a country
- A set of numbers, most commonly proportions of possible values (categories) of the indicator among individuals in a country

We will use the combined survey indicator of worry about crime (Example 1 above) as an example of these cases. The proportions of the six categories of the indicator will be used to demonstrate presentation of proportions. To illustrate presentation of single averages, we combine classes 2 and 3, assign scores 1-5 to the levels of the resulting five-level indicator (with higher values indicating higher levels of worry) and consider country-level averages of these scores.

Presentation of numbers like these is a common task, and many tabular and graphical methods are used for it. The general principles of best practice for such presentations are also well understood (see e.g. Tukey 1977, Tufte 1983, and Wainer 1997 for authoritative overviews), even if not often properly followed. The overriding principle, quoting Wainer (1997), is that "the aim of good data graphics [and tabular presentations] is to display data accurately and clearly". *Bad* presentations are thus produced by not showing much data, showing the data inaccurately or unclearly, or showing much that is not data. From these simple principles follow more specific guidelines, for example that symbols and colour schemes should be used to aid understanding rather than for decoration; that captions and labels should be clear and self-contained; that numbers should not be printed with more precision than is necessary; that graphs should be presented without distortions (visual lying); and that all uninformative decorations and affectations like fake 3-dimensional effects and spurious perspectives should be eliminated. These guidelines will be followed in the main publications of the JUSTIS project.

Consider first an indicator summarised by a single number, such as a country-level average. This is most economically presented as a table, such as Table 1 below. Countries may be listed ordered by the values of the indicator (as in Table 1) or in some natural order such as alphabetically or by location. The former is more effective for a single table, while the latter may be preferable if a report contains several tables of different indicators and it is desirable to use the same order in all of the tables.

Table 1: Estimated averages of a measure of worry about crime in 23 countries. Large values of the measure indicate high levels of worry.

Country	Average	95% confidence interval
All countries	1.83	(1.81 - 1.85)
Norway	1.19	(1.17 - 1.22)
Denmark	1.27	(1.23 - 1.30)
Finland	1.35	(1.32 - 1.39)
Cyprus	1.36	(1.30 - 1.41)
Slovenia	1.42	(1.38 - 1.46)
Switzerland	1.43	(1.38 - 1.47)
Austria	1.47	(1.43 - 1.51)
Netherlands	1.48	(1.43 - 1.52)
Germany	1.50	(1.47 - 1.54)
Sweden	1.51	(1.47 - 1.55)
Ireland	1.55	(1.50 - 1.60)
Hungary	1.61	(1.56 - 1.67)
Poland	1.69	(1.64 - 1.74)
UK	1.71	(1.66 - 1.75)
Belgium	1.73	(1.68 - 1.78)
Estonia	1.87	(1.82 - 1.93)
Spain	1.96	(1.90 - 2.02)
France	1.97	(1.91 - 2.03)
Ukraine	1.99	(1.91 - 2.06)
Portugal	2.06	(2.00 - 2.12)
Russia	2.09	(2.04 - 2.15)
Slovakia	2.11	(2.05 - 2.17)
Bulgaria	2.31	(2.23 - 2.39)

Data from European Social Survey, Round 3, 2006. Averages and their standard errors have been estimated using survey weights within each country, and the estimate for all countries combined using also weights for population sizes.

For a simple single-number indicator, a graphical display may not provide any added value over a table. There are, however, some exceptions. One occurs when the indicator has logical minimum and maximum values, for example 1 and 5 in our five-level measure of worry about crime. Then a *bar chart* like the one in Figure 1 effectively conveys the location of each country's level in this range of possible values (it is then essential that the plot actually includes the full range of the indicator). In Figure 1 we observe that while there is clear variation in the country averages, all of them are relatively close to the lower end of the worry scale.

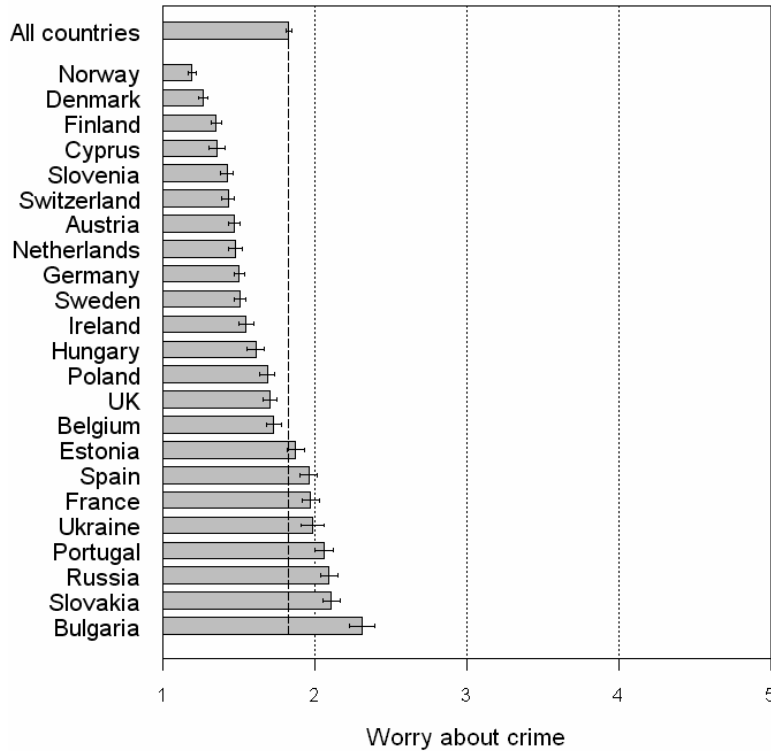
Second, the *locations* of the countries can be related to an indicator by using a map, with countries coloured or shaded according to the value of the indicator. An example is given in Figure 2. This is most effective when the levels of the indicator vary relatively systematically by region. For example, Figure 2 shows that levels of worry about crime tend to be lowest in Northern and Central Europe, and higher in Southern and Eastern Europe.

A table or graph may also include information about the *uncertainty* in the observed value of an indicator. This arises from sampling variation in those indicators which are country-level means or proportions of individual-level variables collected in a survey (level 3 indicators, i.e. inherently country-level variables, are typically treated as known without uncertainty). The level of uncertainty is described by the width of the statistical *confidence interval* for the indicator. Confidence intervals can be easily displayed for single-number indicators (but get increasingly complicated and distracting in presentations of multiple-number ones discussed below). They can be included in tables (see Table 1) and with some care also in graphs (see Figures 1 and 3). Doing so is useful in that it helps prevent overinterpretation of observed differences (e.g. precise rankings of countries) when uncertainty is actually high, but also gives reassurance about the reliability of conclusions when uncertainty is low. For example, the confidence intervals of the average levels of worry about crime in Table 1 and Figure 1 are fairly narrow, so uncertainty is low. Clearly many of the country averages are statistically significantly different from each other and from the overall average.

Consider now the case where the level of an indicator for a country is described by a set of proportions. As an example, consider the estimated proportions in the six classes of worry about crime in different European countries. If we focus on a single proportion at a time – for example the proportion in the least worried class 1 or the combined proportion in the three most worried classes 4-6 – we are back in the single-number case discussed above. If, however, we want to present proportions for all the classes at once, several numbers per country are involved and some further care is required to maintain effectiveness and clarity of presentation.

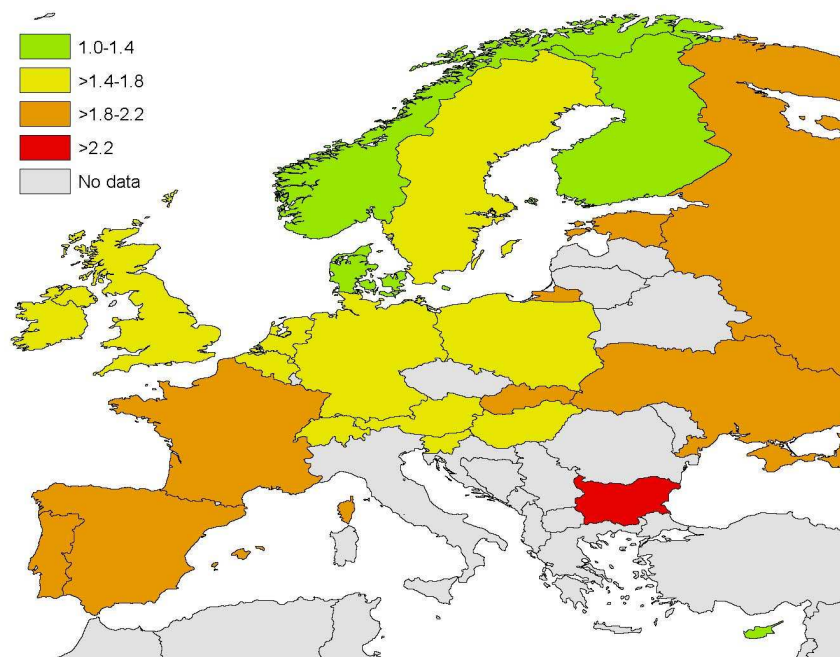
Proportions can be displayed in a standard tabular form, as in Table 2. Alternatively, and often more effectively, they can be shown graphically, as a partitioned bar chart like the one shown in Figure 3. In this chart it is essential that all proportions are included (so that they add up to 1), and it is almost always preferable to order the countries by, say, the proportion of the lowest category.

Figure 1: Estimated averages of a measure of worry about crime in 23 countries. The range of possible values of the measure is 1-5, and large values indicate high levels of worry. 95% confidence intervals of the estimated averages are also shown. The dashed line shows the average for the combined populations of the countries.



Data from European Social Survey, Round 3. Averages and their standard errors have been estimated using survey weights within each country, and the estimate for all countries combined using also weights for population sizes.

Figure 2: Estimated averages of a measure of worry about crime in 23 countries.



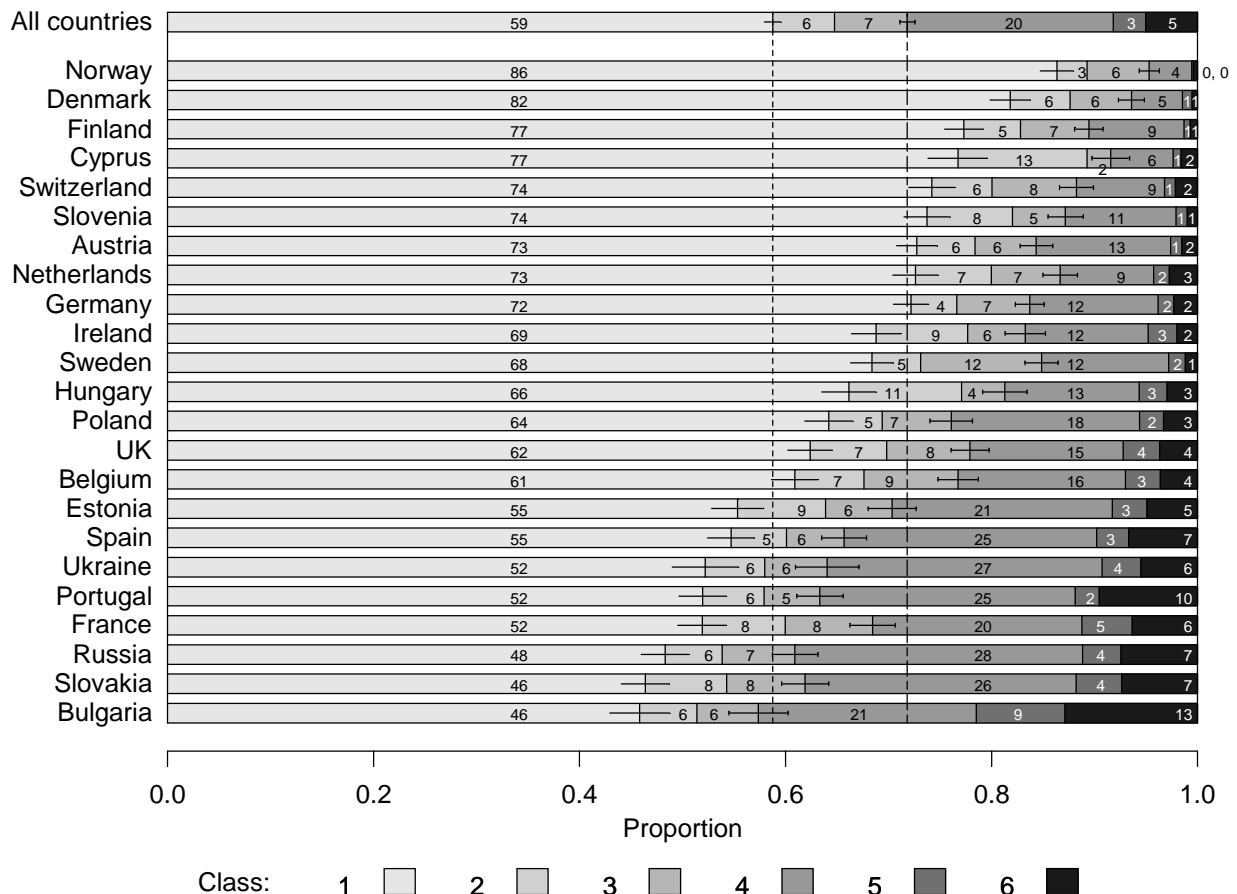
Data from European Social Survey, Round 3, 2006. Averages and their standard errors have been estimated using survey weights within each country.

Table 2: Estimated proportions in six classes of worry about crime in 23 countries. Classes with large number correspond roughly to higher levels of worry.

Country	Percentage in class					
	1	2	3	4	5	6
All countries	58.7	6.0	7.1	20.0	3.1	5.1
Norway	86.3	2.9	6.1	4.1	0.2	0.4
Denmark	81.8	5.8	5.9	4.9	0.9	0.5
Finland	77.3	5.5	6.6	9.2	0.6	0.7
Cyprus	76.7	12.6	2.3	6.1	0.8	1.6
Switzerland	74.2	5.8	8.2	8.6	1.1	2.2
Slovenia	73.7	8.3	5.2	10.7	1.1	1.0
Austria	72.7	5.7	6.0	13.0	1.1	1.5
Netherlands	72.6	7.4	6.7	9.1	1.5	2.7
Germany	72.2	4.4	7.1	12.5	1.5	2.3
Ireland	68.8	8.9	5.6	11.9	2.8	2.0
Sweden	68.4	4.7	11.7	12.4	1.6	1.2
Hungary	66.2	10.9	4.2	13.1	2.7	3.0
Poland	64.2	5.2	6.7	18.3	2.3	3.3
UK	62.4	7.4	8.1	14.9	3.5	3.7
Belgium	60.9	6.7	9.1	16.2	3.4	3.6
Estonia	55.4	8.5	6.5	21.4	3.3	4.9
Spain	54.7	5.4	5.6	24.5	3.1	6.7
Ukraine	52.2	5.8	6.1	26.7	3.7	5.5
Portugal	52.0	6.0	5.4	24.8	2.4	9.5
France	51.9	8.1	8.5	20.3	4.9	6.3
Russia	48.3	5.6	7.1	27.9	3.7	7.4
Slovakia	46.4	7.9	7.6	26.3	4.4	7.4
Bulgaria	45.9	5.5	6.0	21.2	8.6	12.9

Data from European Social Survey, Round 3. Averages and their standard errors have been estimated using survey weights within each country, and the estimate for all countries combined using also weights for population sizes.

Figure 3: Estimated proportions in six classes of worry about crime in 23 countries. Classes with large number correspond roughly to higher levels of worry. 95% confidence intervals are shown for the proportions in class 1, and for the combined proportion in classes 4-6. The vertical lines in the plot indicate estimates of these proportions for the combined populations of the countries.



Data from European Social Survey, Round 3. Averages and their standard errors have been estimated using survey weights within each country, and the estimate for all countries combined using also weights for population sizes.

3. JOINT PRESENTATION OF MULTIPLE INDICATORS

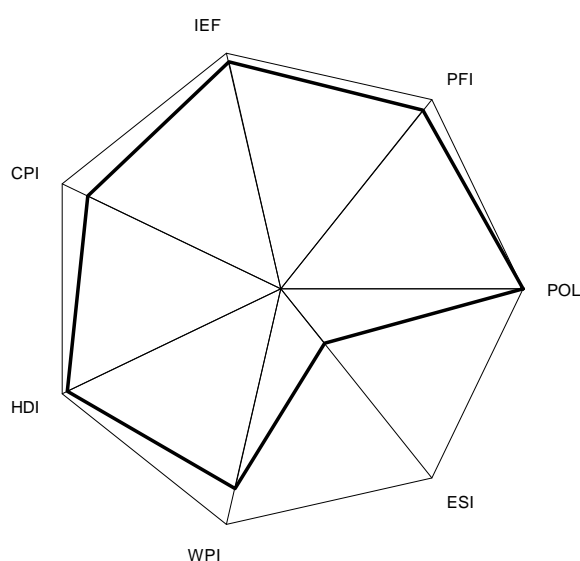
Suppose now that, for each country, we are considering several indicators at once, for example the seven national indicators of development in Example 2 introduced in Section 1. Suppose that the goal is to display and compare the sets of values of these indicators taken together. In other words, the goal is not to simply present each indicator in turn using the methods of the previous section, but to examine the patterns or *profiles* defined by the values of the several indicators for each country.

Designing this kind of joint presentation, trying to balance clarity and accuracy, is more challenging than devising displays for single indicators. Tabular methods are not mostly ineffective, so we will focus on graphical ones. All such tools employ the same basic idea: the values of the indicators are each mapped onto the sizes of different features of some two-dimensional object, and the pictures of the resulting objects, one for each country, are used to represent the profiles of the countries. Comparisons of the profiles then rely on our visual ability to detect differences in shapes and sizes of the objects.

Various methods of achieving this have been proposed in the literature, using different target objects (for examples, see e.g. Chambers et al. 1983 and Krzanowski 2000). Here we consider only one possibility, the *spider plot*, also known as "web", "radar", "polar" or "star" plot (its earliest use appears to be in von Mayr 1877). We have chosen this type of plot because it is simple to create, flexible, visually effective and easily interpretable.

The design of a spider plot is illustrated by Figure 4. Each of the indicators being presented is assigned to one of a set of axes which radiate outwards from the centre of the plot. The centre corresponds to the minimum value of every variable (either the logical minimum or, as here, the smallest value actually observed in the data) and the ends of the axes to the maximum values. The value of each indicator for a country is represented by a point at the appropriate point along the corresponding axis. Finally, the points for the country are connected by lines. The resulting closed curve is the representation of the profile of the country in terms of the indicators included in the plot.

Figure 4: An example of a spider plot. Values of seven indices of development for the United Kingdom.



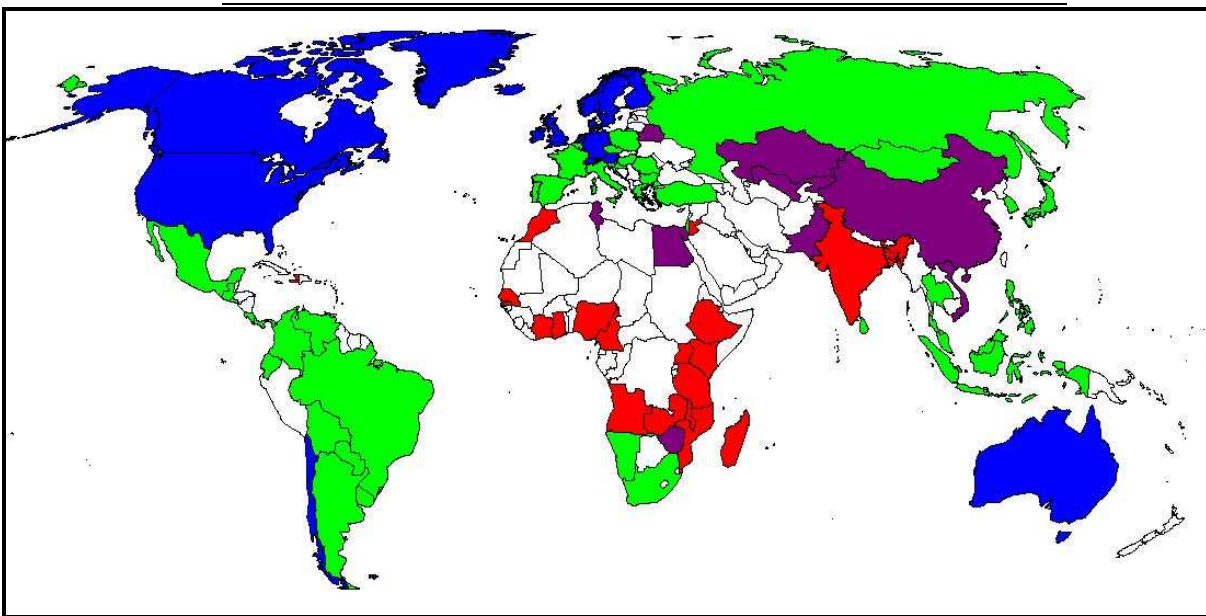
The indices are defined on p. 5 of this report.

A spiderplot is visually effective even for a single country. Since points close to the centre correspond to small values, and points further out to large values of the indicators, the *size* of the area defined by the curve is an indication of the average magnitude of indicators for the country. Furthermore, profiles where some indicators are relatively larger than others translate into asymmetric curves in the plot. The effect of this can be enhanced by a sensible assignment of indicators to the axes. For instance, in the examples shown here we have placed conceptually most closely related indices next to each other (e.g. Press Freedom Index and the Polity Score next to each other, and the Human Development Index and Water Poverty Index next to each other). Common profiles of the indices will then translate into particular clearly asymmetric patterns.

A spiderplot becomes still more effective when curves for several countries are drawn in the same plot, as in Figure 5. (This figure actually shows curves for four *clusters* of similar countries, which were derived using statistical cluster analysis of the data; the map in Figure 5 shows which countries belong to which cluster.) Profiles of different countries can then be easily compared. For example, one curve may be entirely outside another, indicating that one country has higher values of all the indicators than another; here this is the case for cluster 1 (in blue) compared to the others, and for cluster 2 (green) compared to 3 and 4. In other comparisons, neither country dominates the other in this way, but the countries' curves are asymmetric in different ways. In Figure 5, this is the case for clusters 3 and 4: in particular, cluster 3 (in red) has higher values of indices of broadly political development (POL, PFI and IEF), while cluster 4 (purple) is clearly higher in indices which are largely measures of wealth (HDI and WPI). Similarities as well as differences can also be easily detected. For example, analysis of many countries often reveals a few distinct patterns of values, each represented by a group of countries with broadly similar profiles.

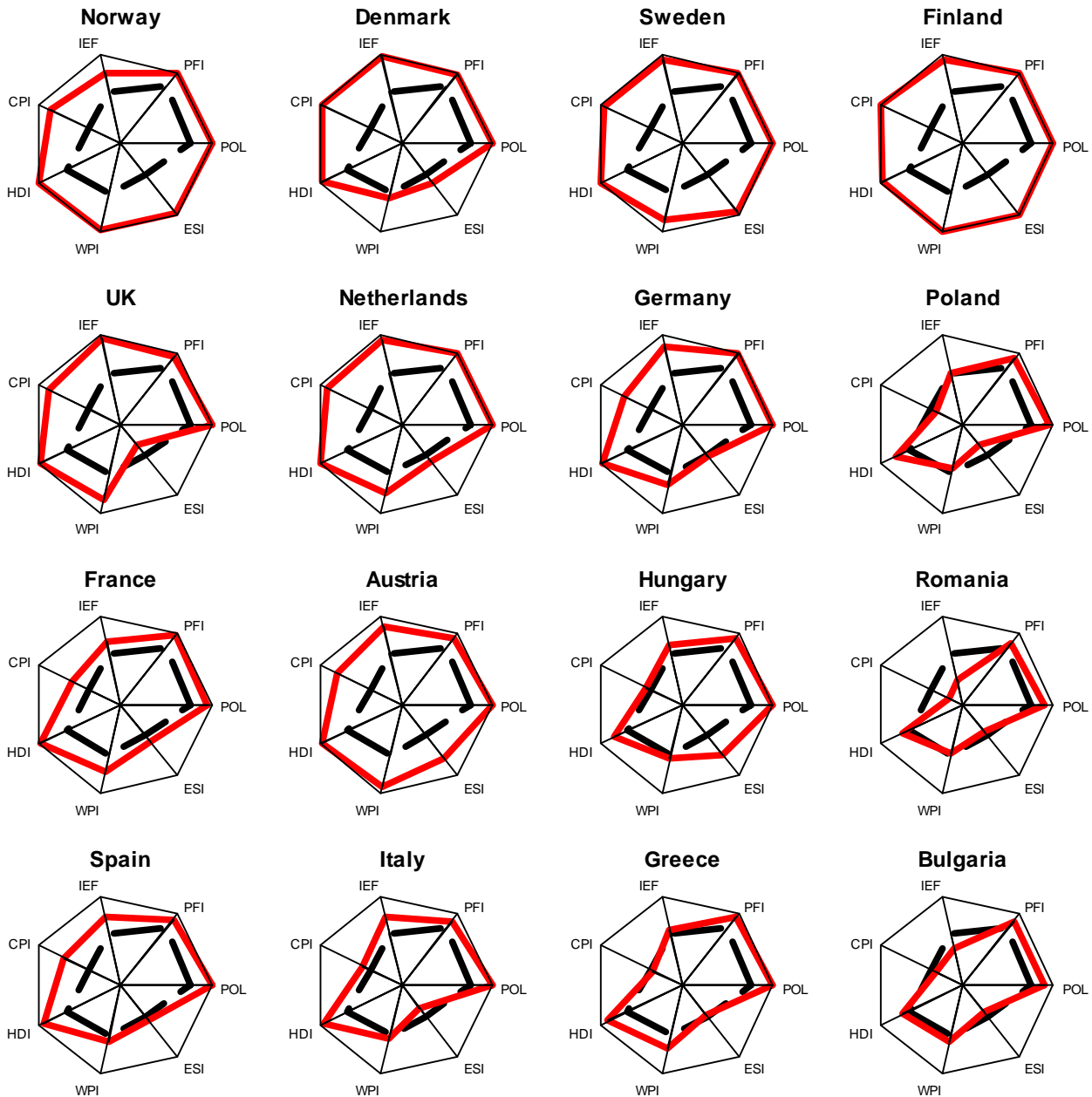
Finally, it is often useful to include in the plot a benchmark curve, for example one for the average of all the countries. This is especially useful when the number of countries is large, so that it is not practicable to plot all of them in the same plot, and we need to use separate plots for different countries (or groups of countries). If the same benchmark curve is included in each of the plots, it serves as a visual link which facilitates comparisons across the plots. An example of this is shown in Figure 6.

Figure 5: Spider plots of seven indices of development for four clusters of countries. The countries belonging to each cluster are identified by the corresponding colours in the map below.



The indicators are defined on p. 5 of this report.

Figure 6: Spider plots of seven indices of development for selected European countries. The dashed line shows the average of the indices for 83 countries across the world (see the map in Figure 5 for the distribution of these countries).



The indicators are defined on p. 5 of this report.

4. WAYS FORWARD FOR JUSTIS

The next steps in the JUSTIS project are to collect level-3 indicators, to pilot the level-1 and level-2 indicators in the demonstration projects, and to integrate the survey and contextual data into effective presentational devices that will highlight levels of trust and legitimacy in countries across Europe. A key task will be to construct simple, accessible and efficient ways of collating and presenting the information, probably using graphical devices such as spidergrams outlined in the current deliverable. Alongside this will be brief summaries of specific contextual factors which may vary from one jurisdiction to another, describing different systems of law and government, or cultural and historical factors which characterise public opinion and the relationship between citizens and criminal justice institutions.

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