

ASSESSMENT OF DAYLIGHT SAVING TIME



TAB-FOKUS No. 8 REGARDING REPORT No. 165

FEBRUARY 2016

SUMMARY

- › The Directive 2000/84/EC stipulates the application of daylight saving time arrangements as mandatory for all EU Member States for an unspecified period. Any change with regard to daylight saving time requires an amendment of this directive.
- › In 2007, the European Commission concluded that daylight saving time would have only little impact.
- › With regard to energetic aspects and based on the current state of knowledge, this conclusion still can be considered to be valid.
- › Moreover, there are no indications to question this conclusion with regard to economic aspects.
- › In view of health-related aspects, further research is required for an in-depth examination and evaluation of the short-term and long-term implications related to the time change.
- › An amendment of the Directive 2000/84/EC can be proposed in different ways. Whether or not a corresponding legislative procedure will be initiated is at the discretion of the European Commission.

WHAT IS INVOLVED

The so-called »daylight saving time« (DST) or »summer time«, i. e. setting clocks forward by one hour during the summer months, was introduced in many European countries in the years following the first oil crisis in 1973. The objective of these DST arrangements was to better utilize daylight and to save energy. As of 1980, DST was introduced both in the Federal Republic of Germany and the German Democratic Republic. At that time, the German Federal Government primarily aimed at realizing a harmonization of time arrangements with the neighbouring states.

Right from the beginning, there were efforts aiming at a joint implementation of DST within the European Community to prevent disturbances of the internal market due to different time arrangements. This process resulted in the present Directive 2000/84/EC on summer-time arrangements which stipu-

lates the application of DST arrangements as mandatory for all EU Member States for an unspecified period.

Since its introduction, there have been controversial debates on the potential benefits of DST. In 2007 for the last time, the European Commission concluded that – apart from the fact that it provides greater opportunities for a wide range of evening leisure activities and produces some energy savings – DST would have only little impact. Due to the fact that no EU Member State expressed a wish to abandon DST or change the provisions of the current Directive, the Commission took the view that the DST arrangements as introduced by the Directive continue to be appropriate.

However, the framework conditions to be considered in the context of the implications of DST partly have changed since 2007. The structural changes in the energy sector, shifts between economic sectors, new employment schemes or changes with regard to mobility and leisure behaviour might give reason to a substantial reassessment of the implications of DST. Under this impression, the scientific findings and experience gained since 2007 have been examined and presented in a general overview.

IMPLICATIONS OF DAYLIGHT SAVING TIME FOR THE ENERGY CONSUMPTION

With regard to **power consumption**, in almost two thirds of all analyses published so far, only **marginal savings** have been determined. Relating the results of all studies to the national power consumption of the respective countries yields values ranging from -0.9 to 1 % with regard to the impact on power consumption. For most of the studies, a reduction of less than 0.2 % of the power consumption or 0.03 % of the final energy consumption of a country has been determined.

CLIENT AND TOPIC INITIATIVE

Committee on Education, Research and
Technology Assessment
+49 30 227-32861
bildungundforschung@bundestag.de

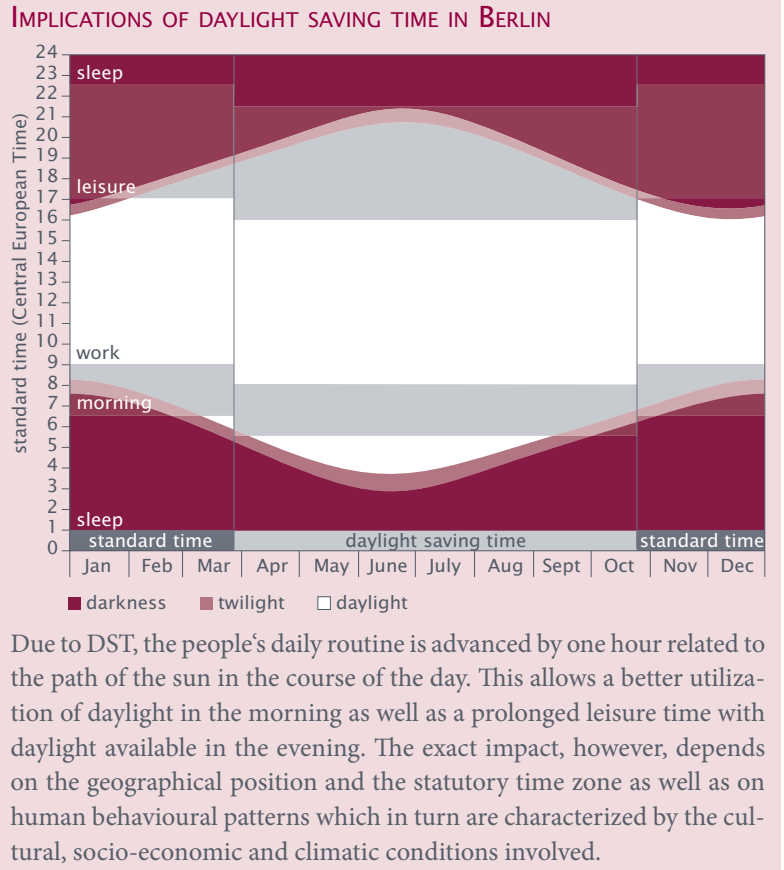
In the field of **room heating**, only marginal effects ranging from -0.2 to 0.2% are assumed for the most part. For **air conditioning**, the margin ranges between -0.2 and 9% with the implications strongly differing in the respective countries.

The analyses have been carried out in different countries. As the severity and degree of the implications for energy consumption strongly depend on the geographical, economic and cultural framework, results obtained in other countries cannot be simply transferred to Germany or the entire European Union. Moreover, it is methodically difficult to actually assign the changes observed to DST. Altogether, the **published scientific state of knowledge** still is **limited**.

In model simulations regarding the power consumption of German households for lighting, a **reduction in power consumption** of less than 0.8% in relation to the annual power consumption was determined (this corresponds to a decrease of 0.2% for the national power consumption). For the first time, the simulations allowed to quantify the impact of DST on private households using photovoltaics (PV) for the generation of power which they are not only using themselves, but also feeding into the public power grid. Due to DST, the correlation between power consumption and power generation by means of PV increases by approximately 5% compared to the situation without DST – which increases the economic efficiency of private PV systems.

No new findings have been revealed by a **survey carried out among more than 700 players** from the German energy industry which was intended to supplement the results of literature analysis and model simulations.

Thus, with regard to the **energetic effects** and **according to the current state of knowledge**, the conclusion drawn by the European Commission in 2007 still can be considered to be **valid**.



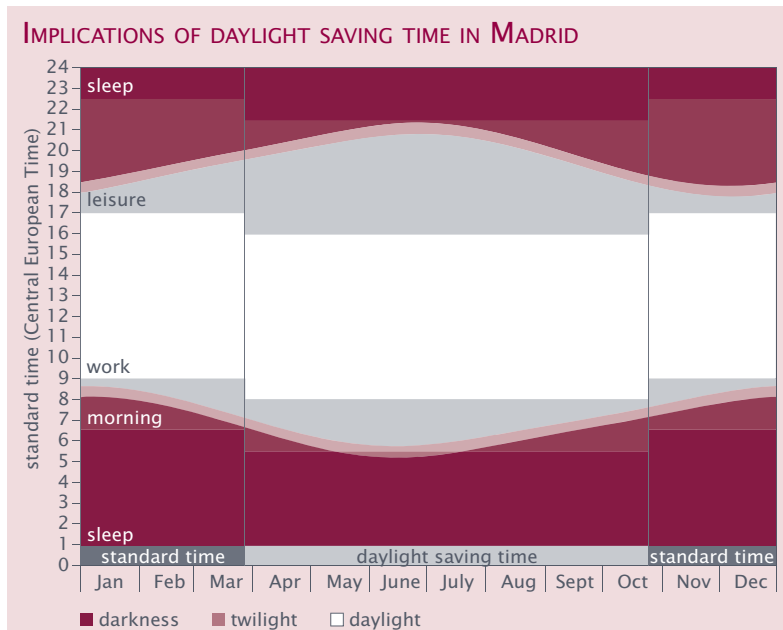
IMPLICATIONS OF DAYLIGHT SAVING TIME FOR THE ECONOMY

It can be concluded from the few available scientific or accessible non-scientific sources that changing the clocks in spring and autumn might induce a **short-term need for adaptation in individual sectors** (i. a. in agriculture or rail traffic). However, this apparently has become a rather unproblematic **routine task**. The tourism and leisure industry might benefit from a longer daylight period in the evening which would provide greater opportunities mainly for outdoor leisure activities.

However, for the most part, all published information is based on subjective opinions. As long as there is no reliable evidence-based scientific basis regarding effects related to DST, **no conclusions can be drawn with regard to a macroeconomic benefit or damage due to DST**.

2007: THE EUROPEAN COMMISSION'S ASSESSMENT OF THE IMPLICATIONS OF DAYLIGHT SAVING TIME

- For the **energy sector**, the European Commission stated that recent quantitative studies confirm energy savings, albeit small ones. As evidence, the European Commission cited studies from five EU Member States the scientific base and validity of which, however, cannot be assessed due to a lack of references.
- For **economy**, it could be assumed that the economic sectors most affected by DST arrangements have embraced DST and no longer question its *raison d'être*. Until 2007, however, there was virtually no evidence-based scientific literature regarding the implications of DST for the economy.
- According to the Commission, the potential **effects on human health** are linked to the fact that the human body has to adapt to the time changes. Taking into consideration the state of research (at that time), it could be assumed that most of the difficulties experienced with regard to the time change are of short duration and are not a health hazard.



Compared to the situation in Berlin, the daylight period in Madrid – due to its south-western position – in the summer is shorter and postponed towards the evening. As a result of DST, on a typical working day, people are getting up at dawn even in the summer. Thus, the **benefits of DST** are likely to be **assessed very differently** within the European Union. Experience gained in Germany cannot be simply transferred to other countries.

A survey among German industry associations, trade unions and professional associations had a very **low response rate**. It may be assumed that in case of major difficulties due to the application of DST arrangements in individual sectors there would have been stronger activities by stakeholders from these sectors.

Thus, due to the very limited data and evidence available, **no indications** can be found which might give reason to **question the conclusion drawn by the European Commission** in 2007.

IMPLICATIONS OF DAYLIGHT SAVING TIME FOR HEALTH

Meanwhile, there are more and more scientific indications that the biological rhythms of humans **cannot adapt particularly to the clock change in spring as easily** as had been

assumed only a few years ago. In this context, new findings indicate that **even within four weeks after changing the clock, for some people the process of adaptation itself takes place only insufficiently or not at all**. In contrast, the clock change in autumn seems to be less problematic. Generally, processes of adaptation (e. g. of sleeping times) are likely to be completed within one to two weeks after the clock change.

However, it also has to be noted that the **relevant impact** of disturbances in the biological rhythms due to time change on **human health is still unclear**. Indeed, the degree of these disturbances seems to be too low to assume that serious or long-term health impairments have to be expected.

Most of the current empirical studies could not prove any harmful effects of time change on **human performance**. Moreover, there seem to be no serious implications affecting the **psyche or mental health**. With regard to a possible correlation between time change and the **risk of heart attacks**, the partly contradictory results of the studies do not reveal any clear pattern. Thus, it is also possible that the time change in spring in fact has no influence on the total number, but only on the time of occurrence of the heart attacks. Furthermore, the heterogeneous results of the studies are not giving any clear answer to the question of what is the impact of time change or DST on **road safety**.

DST offers a prolonged leisure time with sufficient daylight available after work. If this time is used e. g. for sports and/or social leisure activities, this might have a positive impact on health and social satisfaction. However, corresponding effects are difficult to measure. The few empirical studies conducted on this aspect provide inconsistent results.

With regard to a required study design, the studies conducted so far reveal **significant gaps**. Problematic issues to be dealt with are the usually very **short observation periods** and very **small samples**. Moreover, there are no transnational comparative studies also taking into consideration cul-

2015: STATE OF RESEARCH REGARDING THE IMPLICATIONS OF DAYLIGHT SAVING TIME

- › The impact of DST on **energy consumption** can be both positive and negative. Moreover, in most cases, this impact is rather low or negligible. This strongly depends on the climatic, economic and cultural conditions.
- › There are no reliable indications that DST results in a noteworthy benefit or damage for the different **economic sectors**. However, the available scientific data and evidence is very limited.
- › Current analyses on **health implications** of DST increasingly indicate that after changing the clock in spring, for many people the process of adaptation regarding their biological rhythms takes several weeks or does not work at all. However, these disturbances do not seem to have any serious or long-term consequences for physical and mental health. With regard to this issue, further research is required.

tural, mentality-related, socio-economic and geographical aspects in an explicit way. Finally, almost all investigations only refer to healthy test persons. Against this background, the **informative value of many studies is rather low**.

All in all, the knowledge gained since 2007 does not justify a substantial reassessment regarding the implications of DST for human health. Nevertheless, it points out that the process of adaptation to the time change might be more difficult for some people than has been assumed in earlier years. An in-depth analysis of the implications for health would **require further research**.

LEGAL SITUATION

A modification of the currently applicable provisions will only be possible by amending the Directive 2000/84/EC on summer-time arrangements within the framework of an ordinary legislative procedure at EU level. Such a procedure could be initiated **in four different ways**:

- ▶ **Initiative launched by the European Commission:** This is rather unlikely, as the DST arrangements have been completely harmonized and laid down for an unspecified period in the course of the approximation of laws. As, moreover, no new relevant scientific findings are available, there currently is no reason for an initiative launched by the European Commission.
- ▶ **Request by the European Parliament:** For this, a simple majority in the European Parliament is required. The European Commission – due to its monopoly of initiative – is not obliged to meet this request. It also can deliver an unfavourable opinion on such initiatives.
- ▶ **Request by the Council:** For this, a simple majority (of the members of the Council) is required. In this case as well, the European Commission would not be obliged to initiate a legislative act.
- ▶ **European Citizens' Initiative:** A potential citizens' initiative has to be backed by at least 1 million citizens from different EU Member States. But even if this quorum is reached, the European Commission – due to its monopoly of initiative – would only be obliged to present its legal and political conclusions on the initiative, the actions it intends to take, if any, and its reasons for taking that action or not.

TAB-REPORT NO. 165

BILANZ DER SOMMERZEIT

CLAUDIO CAVIEZEL, CHRISTOPH REVERMANN,
ASSISTED BY SIMON RABAA



WEBSITE OF THE PROJECT

www.tab-beim-bundestag.de/en/research/u20100.html

PROJECTMANAGER AND CONTACT

Dr. Claudio Caviezel
+49 30 28491-116
caviezel@tab-beim-bundestag.de

CONCLUSION AND OUTLOOK

Altogether, it can be concluded that the **available scientific evidence base and state of knowledge** with regard to possible implications of DST still is **very limited and rather fragmentary**. Nevertheless, it does not reveal **any indications** that the application of DST would induce **serious positive or negative implications** for energy consumption, economy or health. In this respect, the question whether the current DST arrangements will be maintained, amended or abandoned will continue to be – for the foreseeable future – the subject of political and public debates which can rely on scientific facts only to a very limited extent. Whatever the results of such debates may be: Any modification of the present DST arrangements requires an amendment of the Directive 2000/84/EC. Whether or not to initiate a corresponding legislative procedure aiming at amending the present provisions **is subject to the sole discretion of the European Commission**.

The Office of Technology Assessment at the German Bundestag (TAB) is an independent scientific institution which advises the German Bundestag and its committees on questions of scientific and technological change. TAB has been operated by the Institute for Technology Assessment and Systems Analysis (ITAS) of the Karlsruhe Institute of Technology (KIT) since 1990. It has been cooperating with the Helmholtz Centre for Environmental Research – UFZ, the IZT – Institute for Futures Studies and Technology Assessment and VDI/VDE Innovation + Technik GmbH since September 2013. The Committee for Education, Research and Technology Assessment decides on TAB's work programme, which also includes subjects proposed by other parliamentary committees. The standing »TA Rapporteur Group« consists of one member from each of the parliamentary parties: Dr. Philipp Lengsfeld (CDU/CSU), René Rösler (SPD), Ralph Lenkert (Die Linke), and Harald Ebner (Bündnis 90/Die Grünen) and the Chairwoman of the Committee, Patricia Lips (CDU/CSU).