German Geographical Society

Educational Standards in Geography for the Intermediate School Certificate

with sample assignments

Deutsche Gesellschaft für Geographie DGfG

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Content

Foreword

The establishment of Educational Standards for every discipline is of major significance with regard to quality assurance and the development of the discipline's content. The Permanent Conference of the Ministers for Education and the Arts of the federal states of Germany (Kultusministerkonferenz, KMK) has taken on this task for some subjects, but not for geography. Academics, lecturers in geography education and geography teachers, however, recognize that there is a need to develop such standards for the subject of geography in order to secure and improve the quality of the educational process for the subject in schools. These standards present a common nationwide foundation for the curriculum, and will position geography in terms of the politics of the discipline. The German Geographical Society (DGfG) has taken the initiative to establish these standards for geographic education. This brochure presents the results of its consultations, and all of the subsidiary geographical associations have agreed to these standards.

In response to international comparative studies, the KMK has placed a special emphasis on the development and implementation of national Educational Standards. These Educational Standards define the competencies that students should possess upon completion of a specific phase of their education; thus they are a crucial element of quality assurance. They are general standards and not minimum standards.

Up to now the KMK has supervised the development of standards for German, mathematics and the first foreign language learned as well as biology, chemistry and physics. While it was initially planned to develop standards for all subjects, in the autumn of 2004 it became apparent that the KMK would not commission standards for any further subjects in the foreseeable future because of the high costs involved. As a result the DGfG decided to develop standards for geography on its own initiative and to present these to the KMK and the cultural authorities in the federal states.

The Association for Geographical Education in Germany (HGD) set up a working group early in 2005 to develop a draft version. It used the so-called Klieme-Expertise as well as existing geographical documents (International Charter of Geographical Education, Curriculum 2000+, Basic Curriculum) and made use of insights from the debate among lecturers in teaching methods, geography teachers and academic geographers. The interim results were presented and discussed at two conferenc-

es. At the same time talks were held with the KMK. By mid-November 2005 the first draft version was ready and was approved in its basic structures by the committee of the HGD and on the 3rd of December by the committee of the DGfG. It was then presented for further discussion. A number of committed geography teachers and lecturers in teaching methods as well as academic geographers made significant contributions. This version was revised several times. In February 2006 a summit meeting of the HGD and the VDSG (Association of German School Geographers) took place, where most of the final editing was carried out. The executive committee of the VDSG confirmed the final version on March 18th 2006, followed by the general committee of the VDSG on May 14th 2006. The final version was sent to the KMK, the 16 Ministries of Education and the Arts and a number of influential educational scientists. Geography was thus the first subject to develop national standards for the Intermediate School Certificate on its own initiative in co-operation with teachers, lecturers in teaching methods and academics.

The implementation of the standards involves several steps: curricula and exam questions should be adapted to the Educational Standards. Furthermore, the standards will be included in teacher training and further education as well as in the development of schools and teaching. A new element of the system is the empirical testing of the extent to which competences are actually attained at the intended point in time. Because of the high costs and the limited capacities of the Institute for the Development of Quality in the Educational System (IQB) at the Humboldt University in Berlin, the development of comparative exercises and actual testing are only planned for the core subjects in the foreseeable future. The IQB will validate the standards presented by the KMK, make them more precise and standardise them. Thus, the Educational Standards remain open for the further development of discourse between educators involved in academic geography, geographical teaching methods and geography in the schools.

The following must be considered with regard to adapting curricula to the standards: Educational standards describe the target level to be achieved by a specific school certificate. They focus attention on cumulative learning, i.e., learning achievements built up over the long term (output). Curricula describe and structure the way to attain this objective (input). In Germany, curricula and outline plans that describe learning goals and the material to be learned systematically and in the order in which they should be achieved, will continue to exist alongside the standards. The compatibility of the curricula with the Educational Standards must be examined in each federal state and relevant timetables must be taken into account.

The next steps for geography consist of the formulation of sample exercises to make the standards more specific. Furthermore, competence models must be designed that will clarify in what age group and under what circumstances the individual competences are to be developed.

We are very pleased with the high level of consensus and the positive reception of these Educational Standards for Geography in all aspects of our subject, and also with the positive response from the Ministries for Education in all the federal states.

Elmar Kulke (DGfG), *Ingrid Hemmer* (HGD), *Eberhard Schallhorn* (VDSG)

Foreword to the 2nd edition

The editors are pleased to offer you the second English edition of the Standards, which now also includes sample assignments.

Bonn in July 2012
Hans-Rudolf Bork (DGfG), *Ingrid Hemmer* (HGD), *Frank Czapek* (VDSG)

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The national Educational Standards can be downloaded as PDF files from the websites of the geography associations (e.g., http://compute.ku-eichstaett.de/hgd/index.php?section=docsys&category=2).

1 Geography‘s contribution to education

Geographically and geoscientifically relevant phenomena and processes such as globalisation, climatic change, earthquakes, flooding and storms, as well as population change, migration, disparities and conflicts over resources, shape many aspects of our lives and our societies on planet Earth.

Dealing with these complex developments calls for adaptation of previous behaviour and strategies on the basis of sound knowledge, judgement and problem-solving competence, e. g., in the areas of environmental protection, risk assessment, urban and regional planning, water supply issues, economic development and developmental policy co-operation. Because the dynamics of these processes stem from the interactions between natural, physical geographical conditions and human activities, these qualifications can be developed especially through the combination of natural science and social science education. It is in this very area that geography‘s special potential lies.

Education in the natural sciences furthers the perception and understanding of natural phenomena; at the same time it examines the specific methods used in the natural sciences, their applications and their limitations. Education in the social sciences furthers an understanding of social, political and economic events, structures and processes; it also includes knowledge of social sciences methodologies. The special contribution of the subject Geography to an understanding of the world lies in its examination of the interrelations between nature and society in different sizes and types of space. Thus it is a school subject which first, has a central concern with the topic of spatial aspects and secondly, links knowledge from natural science and social science. Thus, geography is a bridging subject between these areas of science and education.

The main goals of geography lessons are therefore to provide insights into the connections between natural conditions and social activities in different parts of the world, and to teach an associated spatially-oriented competence that can be applied. These main goals are in accordance with the International Geographical Union‘s "International Charta of Geographical Education", the "Curriculum 2000+" of the German Geographical Society as well as the "Basic Curriculum" of the Association of German School Geographers.

In accordance with these aims, students of geography have the opportunity to recognise interactions between nature and society (economy, politics, social aspects) based on selected regional examples, They can also learn to understand the resulting structures, processes and problems involved with these interactions and to consider solutions for these problems. To this end an understanding of the Earth as a system is necessary, i. e. of the various natural systems and subsystems of the geosphere. Thus geography is a centralising subject for all aspects of geosciences relevant to schools (see Leipzig Declaration of the German Geographical Society/ Alfred Wegener Foundation). It also furthers an understanding of social systems in their main spatially relevant basic structures.

With this general geographical approach, geography lessons make a special contribution to the encouragement of multi-perspective, systematic and problem-solving thinking.

Space, as well as time, is an existential aspect of our lives and it is therefore urgently necessary to consider it in detail. The ability to orient oneself spatially in different ways is therefore an important geographical competence, going well beyond the possession of basic topographic knowledge and serving as the foundation for the development of further geographical competences. However, students do not only acquire spatial orientation competence, but also analyse regions of the Earth at different scales, e. g., their homeland Germany, Europe and selected non-European regions, from different perspectives and with regard to various problems. In this way they acquire fundamental regional geographical knowledge about regions, nations and groups of nations as well as the potential to develop a considered awareness of their home country, awareness as Europeans and cosmopolitan attitudes between the global and the local. In geography, spaces are examined from various perspectives: as concrete, material spaces, as thematically/systematically ordered spaces, as individually perceived spaces or as socially constructed spaces.

Geography as a subject is traditionally strongly oriented towards methods and media; (visual) clarity and topicality play a major role. Students have an opportunity to become familiar with numerous traditional and computerised media. They thereby acquire the ability to use media effectively and in an informed and considered way; in particular the use of all types of maps is learned. Students also acquire a methodological competence that is essential for self-determined learning and action. Field trips and projects make possible the inclusion of reality outside of school and students‘ own active experiences.

Geography as a school subject makes a significant contribution to interdisciplinary and co-operative tasks in education. The following will highlight those aspects that are of particular significance to the subject. Together with biology, geography is a central subject in environmental education. Students learn from examples of many environmental themes, both close to home and far away, that natural science and social science have to be interconnected. Education in development policy and intercultural learning are also particularly important aspects of geography teaching in schools. By considering natural, economic, political and social interrelations, students acquire important competences in these areas. Because of its contents and function, geography is particularly committed to education for sustainable development (see UN Decade 2005–2014) as well as to Global Learning.

The aims, contents and methods of basic geographical education are a major element of general education and also create the foundations for connectible vocational learning in many professional areas, e. g., in planning, environmental protection, tourism and public and private economic development.

2 Areas of competence of the subject geography

On completion of the Intermediate School Certificate, students will have acquired general competences in natural and social sciences as well as specific geographical/geosciences competences.

Competences are "... the cognitive abilities and skills available to individuals or learnable by them to solve specific problems, as well as the associated motivational, volitional and social readiness and abilities to apply these problem solutions successfully and responsibly in variable situations" (Weinert 2001, p. 27 f.). The individual expression of these competences is determined by the following factors: ability, knowledge, understanding, skill, action, experience and motivation (see Klieme 2003, p. 73). Educational standards specify competences that students should have in order to be considered as having attained certain important educational goals. Competences and standards describe learning outcomes for students up to the completion of the Intermediate School Certificate.

Geography is an integrating subject between the natural sciences and social sciences, which has consequences for its competence structure. Parallel to the purely natural science subjects of biology, chemistry and physics, geography includes the competence areas of subject-specific knowledge, methodology, communication, evaluation. Furthermore, building on these four areas of competence, geography includes action as a separate area of competence. This area can also be found in other social science subjects. A unique characteristic of geography is the area of competence in "spatial orientation".

The competences from these areas lead not only to understanding natural and social interrelations in various parts of the world, in the context of the main aims of the subject, but also to a considered, ethically-grounded and responsible ability to act spatially. These areas of competence overlap. The desired overall geographical competence ensues not from the addition but from the interconnection of the individual areas of competence. The competences and standards of the various areas are not acquired in isolation but within the framework of specific problems and in a geographical context.

Thus geography includes the areas of competence described in the following table. These areas of competence work together and complement each other to create an

overall geographical competence within the framework of general education. Each area of competence is subdivided on the basis of a sound theoretical foundation.

Area of competence	Central competences
Subject-specific knowledge (K)	Ability to understand spaces at different scales as physical and human geographical systems and to analyse the interrelations between man and environment.
Spatial orientation (SO)	Ability to orientate oneself in space (topographical orientation, map-reading competence, orientation in real spaces and reflection upon spatial perceptions).
Gathering information/methods (M)	Ability to collect and evaluate geographically/geoscientifically relevant information in real space and in media, as well as to describe the steps in the gathering of information in geography.
Communication (C)	Ability to understand geographical information, to express and present it and to discuss it appropriatly with others.
Evaluation (E)	Ability to evaluate spatial information and problems, information in the media and geographical insights in terms of specific criteria and in the context of existing values.
Action (A)	Ability and willingness to act in accordance with natural and social conditions in various fields of action.

3 Standards for the areas of competence in geography

In the following, general standards will be formulated for the six areas of competence, which are to be acquired by the students on completion of the Intermediate School Certificate. Sample exercises will relate these to specific content areas.

3.1 Standards for the area of competence "Subject-specific knowledge"

Geography sees the Earth as a human-environment or human-Earth system from a spatial perspective. The central objects of study are the interrelations between the system Earth[1] or its physical geographical subsystems, and humankind or the human geographical subsystems (Fig. 1). Significant contributions are made to the analysis of the system Earth by knowledge from other geosciences and natural sciences, e. g., geology, geophysics, climatology. The analysis of human geographical systems is augmented by insights from other social sciences, in a spatial context, e. g., urban development, economics and ethnology.

Geography is interested in identifying geographical patterns and relationships in the physical and human geographical subsystems. To this end it explains the spatial expression of the components of these systems at different scales, i. e., regional geographical conditions in particular areas (e. g., countries and regions). Spaces are thereby always considered as systems.

The breadth and complexity of geographical information calls for a reduction to the core of geographical/geoscientific knowledge for geography as a school subject, and the use of examples for teaching. This can take place using basic concepts that structure the content of the subject. As geography considers itself as a systems science, the fundamental concept of the subject is the systems concept. Subordinate to this main concept are the system components of structure, function and process as basic subconcepts.

1 The object of study of geography is the geosphere, which is understood as the interconnected system consisting of the subsystems lithosphere, pedosphere, hydrosphere, biosphere and atmosphere as well as the anthroposphere. The anthroposphere includes further subsystems such as settlement, transport and agricultural systems etc. This is the human-Earth system in the broadest sense, which is influenced by processes/energy flows from outer space and the centre of the Earth. In geography and other geosciences, "system Earth" is generally accepted to be roughly the same as the "geosphere", whereby the anthroposphere is an additional aspect of the "system Earth", not as an object but as an external human activity.

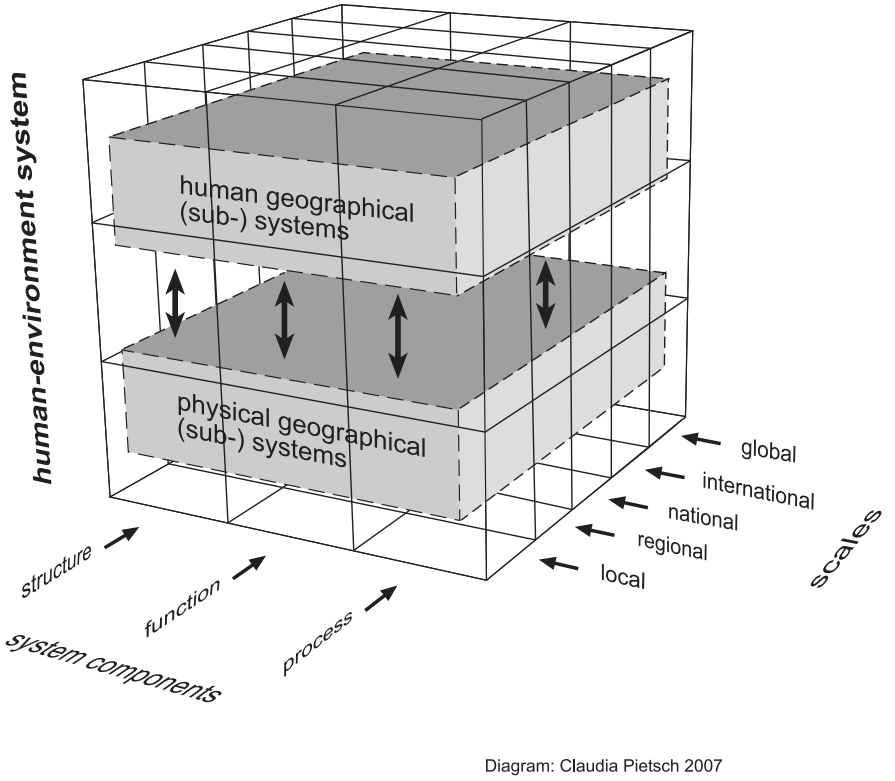


Fig. 1 Basic concepts in the analysis of space in geography

Geographic factors such as relief, climate, settlement and economy in their spatial organisation and distribution form the **structure** of a system. These elements are interrelated and therefore each has **functions** (e.g., the function of climate for vegetation, roadways for settlements, relief for roadways). The spatial systems themselves can also have functions as subsystems for other systems (e.g., city – hinterland). Each individual element of a system, and systems as a whole, change through the interactions among continuous **processes**. These processes can extend over different periods of time and have different spatial extents (e.g., global climatic change, formation of the Alps, vulcanicity in Asia, metropolisation in the world, structural change in the Ruhr region).

The basic concepts of geography apply to human, physical and regional geography as well as to the overall human-Earth system at all scales (Fig. 1).

For students of geography, the fundamental concepts form the foundation of a systematic accumulation of knowledge from a subject and a life-world perspective. They serve to further the vertical integration of the knowledge acquired, e. g., the students can discover similar structures and processes in different areas or contexts in consecutive classes. These concepts are also a basis for the horizontal expansion of knowledge, in that they make connections to other situations and subjects apparent to the students. Thus, for example, similar fundamental concepts are to be found in the natural science subjects.

The subject-specific knowledge (K) for geography as a school subject is structured according to competences (K1 to K5), to which the physical and human geographical systems, the different scales, and the system components contribute (Fig. 1). Competence K1 involves the ability to characterise the whole Earth as a part of the superordinate solar system. Competences K2 and K3 concern the ability to comprehend spaces as physical or human geographical systems (e. g., oceanic systems, the city as a system). The main goal of geography teaching is, however, to develop and establish the competence K4; here students learn to analyse developments and problems in space, examining **physical and human geographical factors and their interactions** (e. g., land-use in various regions, provision of drinking water, urban climates, the regulation of rivers and flooding). The development of this competence is a keystone of education for sustainable development. The analysis of physical and human geographical subsystems is an important precondition for understanding interrelations in this context.

Parallel to the development of competences K1 to K4, with competence K5, students acquire the ability to carry out an independent analysis of individual spaces in the framework of a problem-oriented **regional geography**. The students learn to study selected areas from a geographical/geoscientific point of view and to analyse structures, functions and processes in accordance with this goal. By learning such methods using specific examples, they learn to transfer this knowledge to other areas and recognise similarities and individual differences. This knowledge of the interaction of factors and the processes taking place within and between regions also enables them to predict the future development of regions. It contributes to an ability to evaluate the expected consequences of human intervention in the environment and to act accordingly. This becomes evident in the competence areas "Evaluation" and "Action".

Topographical orientation and knowledge of spatial ordering systems, which have an integral significance for all of the competences listed here, form a separate area of competence – "Spatial Orientation".

These competencies relate primarily to physical areas, or regions, or spatial systems of the locational relationships among physical objects. In geography, space and place are, however, not considered to be simply inherently obvious. They are delimited according to specific perspectives (e.g., the delimitation of Europe from a geological, cultural, political point of view) or are created for different human purposes (e.g., planning regions such as the Euroregios) and are therefore human constructs; spaces are also perceived in quite different ways by individuals and groups (e.g., mental maps of one‘s own country or of Africa). It is an important task of geography in schools to make students aware of these aspects of spatial understanding. These latter perspectives are chiefly anchored in the competence area "Spatial Orientation".

K1 Ability to describe the Earth as a planet

Students can

- S1[1] describe the Earth’s fundamental planetary characteristics (e.g., size, shape, structure, inclination of the Earth‘s axis, gravitational pull),
- S2 explain the position and movement of the Earth in the solar system and the consequences thereof (day and night, seasons).

K2 Ability to comprehend different types and scales of spaces as physical geographical systems

Students can

- S3 outline the natural spheres of the Earth system (e.g., atmosphere, pedosphere, lithosphere, biosphere, hydrosphere) and describe specific interactions,
- S4 describe and explain current spatial aspects of physical geographical phenomena and structures (e.g., volcanoes, earthquakes, drainage systems, karst landforms),
- S5 illustrate past and projected physical geographical spatial structures (e.g., movement of geotectonic plates, glaciation),

1 The abbreviation „S“ denotes the individual standards. In order not to break the flow when reading, the term „geographical“ is used in the standards instead of the frequently used „geographical/geoscientific“.

- S6 describe and explain the functioning of spatial physical geographical factors (e. g., significance of climate for vegetation, of bedrock for soils),
- S7 outline the operation of spatial physical geographical processes (e. g., weathering, weather events, mountain formation),
- S8 outline the interaction of geographic factors and simple cycles (e. g., altitudinal zones of vegetation, ocean currents and climate, the ecosystem of tropical rainforests, the water cycle) as systems,
- S9 apply the knowledge acquired on the basis of examples to other spaces and places.

K3 Ability to comprehend different types and scales of space as human geographical systems

Students can
- S10 describe and explain past and current human geographical spatial structures; they are familiar with predictions of future structures (e. g., political organisation, spatial economic structures, population distributions),
- S11 describe and explain the functions of human geographical spatial factors (e. g., the opening up of settlement areas by transport networks),
- S12 describe and explain the operation of spatial human geographical processes (e. g., structural change, urbanisation, economic globalisation),
- S13 explain the interaction of factors in human geographical systems (e. g., population policy, world trade, megacities),
- S14 explain the consequences of social and political spatial constructs (e. g., wars, migration, tourism),
- S15 explain human geographical interactions between spaces (e. g., town – country, developing countries – industrialised countries),
- S16 apply the geographical knowledge acquired on the basis of examples to other spaces and places.

K4 Ability to analyse human-environment relations in different types and sizes of spatial divisions

Students can
- S17 describe and analyse the functional and systemic interactions among physical and anthropogenic factors in the use and shaping of spaces (e. g., choice of company location, agriculture, mining, energy production, tourism, transport networks, urban ecology),

- S18 illustrate the consequences of the use and shaping of spaces (e. g., forest clearance, water pollution, soil erosion, natural catastrophes, climatic change, water shortages, soil salinization),
- S19 explain and systematize the consequences of the use and shaping of spaces using selected examples (e. g., desertification, migration, resource conflicts, ocean pollution),
- S20 explain possible ecologically, socially and/or economically appropriate measures for the development and protection of spaces (e. g., development of tourism, reforestation, linking-up of biotopes, protection of geotopes),
- S21 transfer knowledge to other spaces at the same or different scale and outline similarities and differences (e. g., global environmental problems, regionalisation, and globalisation, capacity of the Earth and sustainable development).

K5 Ability to analyse different types and scales of space with regard to specific issues

Students can
- S22 formulate geographical questions (e. g., favourable/unfavourable location, equality of living conditions in towns/cities and in the country) for a specific area (e. g., home area, federal state, agglomeration, Germany, Europe, USA, Russia),
- S23 analyse structures and processes in the selected areas (e. g., economic structures in the EU, globalisation of industry in Germany, deforestation in the Amazon Basin, Siberia) in order to answer these questions,
- S24 compare areas according to selected topics (e. g., population policy in India and China, the climate of the USA, Germany, Russia, natural resources in the Arctic and Antarctic),
- S25 label spaces according to specific characteristics and delimit them from one another on a comparative basis (e. g., developing countries – industrialised countries, agglomerations and peripheries in Germany and Europe).

3.2 Standards for the competence area "Spatial Orientation"

Skills in spatial orientation are developed strongly in geography in schools. Students acquire fundamental topographic knowledge and skills in geography classes. One element of orientation competence is a basic knowledge of topographic orientation at different spatial scales (e. g., such as knowing the names and locations of the continents and oceans, the European states and important cities, rivers and mountain ranges in Germany) and knowledge of various spatial grids for orientations and

systems of organisation (SO1), e. g., such as latitude and longitude, climatic and vegetation zones or the classification of the Earth according to economic, political and cultural characteristics. Orientation competence also includes the ability to fit geographical facts into spatial systems (SO2), i. e. the recognition of locational relations, as well as a series of topographic skills relevant to everyday life (SO3), e. g., the competences to read maps and produce simple maps of one's own. It is also a part of geographical education to train orientation skills in towns or the countryside using maps, compass directions and other tools, such as a compass (SO4). Awareness of the subjectivity of spatial perceptions (e. g., the Eurocentric orientation of maps) and of the social constructedness of space and depictions of space provide additional key elements of spatial orientation competence (SO5).

Map competence is not only highly relevant to everyday life but is also a basic qualification for other subjects taught in schools.

Although there are some overlaps with aspects of the knowledge, methods and evaluation of other competence areas, spatial orientation competence is considered a separate area of competence because of its geographical foundations and its high degree of social relevance.

SO1 Possession of basic topographic knowledge

Students
- S1 have basic orientation knowledge at different scales (e. g., names and location of continents and oceans, major mountain ranges of the Earth, the German federal states, major European cities and rivers),
- S2 are familiar with basic rasters and orientation systems (e. g., latitude and longitude, climatic and landscape zones of the Earth, regions at different stages of development).

SO2 Ability to place geographical objects and information in spatial systems

Students can
- S3 describe the location of a place (and other geographical objects and facts) in relation to other geographical units of reference (e. g., rivers, mountains),
- S4 describe in detail the location of geographical objects in relation to selected frameworks and spatial orientation systems (e. g., latitude and longitude).

SO3 Ability to use maps appropriately (map competence)

Students can

- S5 list the basic elements of a map (e.g., projections, generalisation, double flattening of the spherical Earth and relief) and describe how a map is created,
- S6 read topographic, physical, thematic and other everyday types of maps and evaluate them in the context of guiding questions,
- S7 describe the ways in which cartographic information can be manipulated (e.g., through choice of colour, accentuation),
- S8 design topographic sketches and simple maps,
- S9 carry out simple mapping in the context of school exercises,
- S10 design thematic maps with the help of GIS (= Geographical Information Systems).

SO4 Orientation skills in real space

Students can

- S11 determine their location in real space with the aid of a map and other aids to orientation (e.g., landmarks, street names, compass directions, GPS – the Global Positioning System),
- S12 describe a route in real space with reference to a map,
- S13 move in real space with the aid of maps and other aids to orientation (e.g., landmarks, pictograms, compass),
- S14 use schematic diagrams of transport networks.

SO5 Ability to reflect upon spatial perceptions and constructions

Students can

- S15 explain, using cognitive/mental maps, that space is always perceived selectively and subjectively (e.g., comparison of German and Japanese students' mental maps of the world),
- S16 explain, using various types of maps, that representations of space are always constructed (e.g., two different designs for map grids; two different maps of developing and industrialised countries).

3.3 Standards for the competence area “Gathering information/methods”

Methodological competence is increasing in significance for students in order to enable life-long learning. A wide range of methods and media are used in geography teaching to answer geographical/geoscientific questions. There are many sources and forms of information available to students in their lessons for the acquisition of geographically/geoscientifically relevant information.

Methodological competence to deal with geographically/geoscientifically relevant information includes three subsidiary skills: Knowledge of sources and forms of information, and information strategies (M1), the ability to gather information (M2) and the ability to analyse information (M3). The evaluation of information is placed in the competence area "Evaluation" in the model of competence structures used here, communication of/about information as well as the presentation of information is placed in the competence area "Communication". Maps are a media, which is particularly important in geography, and they play a major role in the competence area "Spatial Orientation". It also becomes apparent here that subsidiary competences are not acquired sequentially but in association with each other.

Students of geography learn that geographical information can be found in a wide range of sources (e. g., information books, atlases, in the field, the press, CDs/DVDs) and in numerous information forms/media (maps, photographs, aerial photographs and satellite images, diagrams, statistics, graphic representations, texts). Maps as specifically geographical media play a prominent role. Modern, high-tech sources of information are growing in importance because of their topicality. In geography today it is not sufficient to teach about sources and forms, it is also necessary to teach strategies for gathering and evaluating information. Students acquire this knowledge, can apply it routinely and process geographical/geoscientific information critically and purposefully.

Students use two main ways of gathering information. Firstly, they gather information from the above-mentioned new and traditional media and sources of information. Secondly, the students can gather their own data during field trips in geographical reality or in simple experiments (e. g., observation, mapping, counting and measuring).

In geography lessons students learn how to process information systematically by structuring their information, identifying the most significant information, linking

it with other information and transforming it into other forms. With these qualifications they attain reading competence with regard to so-called non-continuous texts after PISA.

Furthermore, students of geography learn how geographers/geoscientists carry out their research, and begin to develop the ability (M4) to complete, in principle, the same steps in their own search for evidence and solutions. It must be emphasised that this ability is only beginning to be developed by the time the students do the Intermediate School Certificate. Using selected examples, analogous to research procedures, students start with geographically/geoscientifically relevant questions and formulate new hypotheses on causes, interrelationships and solutions. To test these hypotheses they use information from the above-mentioned sources and process it in view of the questions and their hypotheses.

M1 Knowledge of geographically/geoscientifically relevant sources and forms of information and information strategies

Students can

- S1 list geographically relevant sources of information, both traditional (e.g., books, the field) and technical (e.g., Internet, DVDs),
- S2 name geographically relevant forms of information/media (e.g., maps, photographs, aerial photographs, figures, texts, diagrams, globe),
- S3 describe fundamental strategies for gathering information from traditional and high-tech sources and forms as well as information processing strategies.

M2 Ability to gather information to answer geographical/geoscientific questions

Students can

- S4 select information from maps, texts, images, statistics, diagrams etc. in accordance with specific problems, issues and goals,
- S5 in accordance with specific problems, issues and goals, gather information in the field (e.g., observation, mapping, measuring, counting, taking samples, questionnaire survey) or by means of simple experiments.

M3 Ability to process information in order to answer geographical/ geoscientific questions

Students can
- S6 structure geographically relevant information from traditional and high-tech sources and from their own research and extract significant insights,
- S7 purposefully associate the information thus acquired with other geographical information,
- S8 transform the information thus acquired into other forms of representation (e.g., figures into maps or diagrams).

M4 Ability to describe simply the methodological steps for acquiring geographical/geoscientific information and reflect upon this

Students can
- S9 independently pose simple geographical questions and formulate hypotheses to answer these questions,
- S10 describe and apply simple ways of testing hypotheses,
- S11 describe in a simpel manner to acquire information/insights.

3.4 Standards for the competence area „Communication“

Communication competence has a dual function: Communication in the classroom and communication in a social context.

Students learn to understand geographical/geoscientifc facts, to express themselves appropriately using geographical terms and thus to make themselves understood to others. This includes the presentation of such facts and interrelations/ connections in front of others. These various subsidiary communication competences are summarised here as one competence (C1). Students also have the opportunity to exchange ideas in geography classes (C2). These skills should be developed and practiced in the long-term as part of an overall geographical competence.

Geography classes provide a special opportunity in this context, as they usually involve highly relevant themes that are also very important outside of school in society at large (e.g., environmental themes, planning, urban development, migration, natural hazards, cultures, regional geography etc.). This has very much to do with

"putting knowledge into life" (Alexander von Humboldt). Geography lessons are not limited to unequivocal or unambiguous information, but also include a variety of trains of thought and arguments (e.g., when assessing interests and dealing with conflicts in planning, in the explanation and evaluation of natural hazards, justifying predictions etc.). Communication competence is of elementary significance for all of these activities.

Students realise that the geographical/geoscientific contents of schoolwork also depend on communication appropriate to the facts, the audience, and the communicator‘s aims, and that form and content work together. Thus communication does not take place only "after" the acquisition of specialised knowledge but is simultaneously its prerequisite.

C1 Ability to understand and express geographically/geoscientifically relevant statements

Students can

- S1 understand written and verbal geographically relevant statements in everyday and subject-specific language,
- S2 express geographically relevant information (in text, images, graphics etc.) ordered according to the logic of the subject and using specialist terminology,
- S3 differentiate between observations of information and evaluations in geographically relevant statements,
- S4 organise and present geographically relevant statements in a way appropriate to the subject, the situation and the audience/target group.

C2 Ability to speak about geographically/geoscientifically relevant facts, to discuss them and develop a well-founded opinion

Students can

- S5 identify the logical, argumentative and geographical quality of their own and other people‘s statements in the context of geographical issues, and react appropriately,
- S6 weigh geographical statements and evaluations based on selected examples and develop their own, well-founded opinion in a discussion and/or develop an appropriate compromise (e.g., role-playing, scenarios).

3.5 Standards for the competence area "Evaluation"

On the basis of fundamental, integrated geographical knowledge and the skills acquired in the areas of orientation, methodology/acquisition of knowledge and the communication, students can evaluate spatial situations, facts and problems using specialised geographical knowledge (E1) in geography lessons. For this evaluation they take geographical criteria into account, consider physical geographical / ecological and economic and social geographical aspects (especially their mutual influence), take different scales and locations into account and begin to reflect upon the emergence and development potential of natural and cultural landscapes. They also make use of general criteria when discussing advantages and disadvantages, identify the interests of different actors, look at a situation from the point of view of different people affected by it and thereby practice the skill of changing perspectives. In geography classes, students frequently have the opportunity to develop this ability to evaluate using different examples, e. g., by evaluating the construction of a hotel complex, the designation of a conservation area or intervention in an ecosystem according to given criteria. It should be emphasised that this skill is just beginning to be developed when students sit the Intermediate School Certificate.

Geography lessons also teach students the skill to evaluate geographically relevant information gained from various sources and media in terms of their significance and explanatory value (E2). They learn, for example, about the different value of maps, aerial photographs and satellite images or they discover that different emphases can be placed when they transform data into maps or diagrams.

The students examine the social significance of geographical/geoscientific knowledge (E3), in that examples help them to recognise, for instance, the effects that exploration had on the areas travelled and on the explorers‘ countries of origin. They also learn about the consequences and relevance or geographical/geoscientific research findings **using selected examples**, e. g., the prediction of a volcanic eruption or the environmental acceptability of a construction project.

Students are trained to link their evaluation of evidence with geographically relevant values and norms and thus to produce well-founded evaluations (E4). Criteria for evaluations are provided, for example, according to general human rights and the protection of nature and the environment. This leads to the **model of sustainability** (sustainable development). Geography helps students to develop the

ability to evaluate humankind's interventions in nature and the environment (e. g., planning and construction of new housing/a dam) according to their ecological, social/political and economic acceptability. This includes subjective preferences; that may be unavoidable but must be identified and justified.

E1 Ability to evaluate selected spatial situations/facts using geographical/ geoscientific knowledge

Students can

- S1 name general and subject-specific criteria for evaluation (e. g., ecological/ economic suitability, significance now and in the future, perspectivity),
- S2 apply geographical knowledge and the above-mentioned criteria to evaluate selected geographically relevant facts, events, problems and risks (e. g., migration, flooding, development aid, land-use conflicts, cultural conflicts, civil wars, resource conflicts).

E2 Ability to evaluate selected geographically/geoscientifically relevant information from the media in accordance with given criteria (media competence)

Students can

- S3 evaluate information acquired from traditional and modern sources (e. g., school textbooks, newspapers, atlases, Internet) and their own field work in terms of their general explanatory value and their significance for the specific question/issue,
- S4 give a critical opinion on the role of special interests in the presentation of geographically relevant information (e. g., tourist complexes in travel brochures, town plans for children).

E3 Ability to evaluate appropriately selected geographical/geoscientific insights and perspectives in terms of their significance and consequences for society

Students can

- S5 express a critical opinion on the consequences of selected geographical insights in historical and social contexts (e. g., consequences of different conceptions of the world/explorers' reports),

- S6 express an opinion on selected geographical statements with regard to their social significance (e. g., predictions of natural hazards and environmental risks).

E4 Ability to evaluate selected geographically/geoscientifically relevant facts/processes having regard to geographical and interdisciplinary values and norms

Students can
- S7 name geographically relevant values and norms (e. g., human rights, environmental protection, sustainability),
- S8 evaluate geographically relevant facts and processes (e. g., watercourse regulation, tourism, development aid/economic co-operation, use of resources) in terms of these values and norms.

3.6 Standards for the competence area "Action"

On the basis of the competences acquired in all of the areas described here, students acquire the ability to potentially become appropriately active in specific situations and contribute to solving problems. This should/could lead to willingness to act.

Responsible action can only take place when basic subject-specific knowledge is augmented by the teaching of action-relevant knowledge (e. g., knowledge of potential solutions, spatial problems, environmentally friendly measures) (A1) is taught and when the students are also motivated/interested (A2). Numerous factors can hinder their willingness to act and take real action, even when knowledge and interest are present. Nonetheless, together with other school subjects, geography aims to develop a willingness to take appropriate action (A3). It should be borne in mind that the influence of school lessons is limited and that factors external to school, especially the students‘ parents and friends, play a large role. Students should not be manipulated in school or forced to take action, but should decide to take action after serious thought and for good reasons. A distinction can be made between informative action, political action and everyday action. Geography lessons should enable and encourage students to think about the consequences of action planned or carried out and possible alternatives (A4).

Numerous fields of action are discussed in geography classes. Firstly, the wide range of everyday activities whereby aspects of the environment are used, shaped, and "geography is made". A special role is played by the value-oriented fields of action for environmental protection and intercultural and international understanding in One World, all of which come together in the overall model of "sustainable development".

Students gain a basic understanding of natural systems and the consequences of intervention in these systems. This can lead to a high regard for a near-natural environment and willingness to become active in environmental protection. The inclusion of anthropogenic aspects can help the students to develop an awareness of man‘s threat to natural habitats as well as risks to humans from natural hazards. In this way geography can make a significant contribution to encouraging students to participate actively in the avoidance and reduction of environmental damage.

On the basis of their geographical knowledge of regions and social systems as well as the development/acquisition of a corresponding value system, the students can be encouraged to develop the ability and willingness to work for peaceful coexistence on Earth, to co-operate in planning projects for the promotion of intercultural understanding in their own country and to support development aid measures.

Their understanding of the interactions among physical and human geographical factors, i.e. ecological, economic and social/political factors, gives the students insight into the need for sustainable development, from the local to the global level, and also gives them the ability and willingness to act accordingly.

A1 Knowledge of information and strategies relevant to action

Students are familiar with

- S1 environmentally and socially acceptable lifestyles, economic activities and products as well as solutions (e.g., use of public transport, organic farming, renewable energy sources),
- S2 measures to prevent/reduce damage and risks (e.g., tsunami warning systems, unsealing surfaces, land reclamation),
- S3 ways to identify prejudice (e.g., with regard to people from other cultures) and to mitigate them.

A2 Motivation and interest in geographical/geoscientific fields of action

Students are interested in

- S4 the variety of nature and culture in their home area and in other regions,
- S5 geographically relevant problems at a local, regional, national and global levels (e. g., ocean pollution, flooding, poverty in developing countries),
- S6 orientation towards geographically relevant values.

A3 Willingness to take specific action in geographically/geoscientifically relevant situations (informative action, political action, everyday action)

Students are willing to

- S7 provide other people with geographical information about relevant fields of action (e. g., environmental and social acceptability of a by-pass, the necessity to construct a dyke or to provide areas for flooding, sustainable urban development, sustainable agriculture),
- S8 understand geographically based decision-making processes in planning policy and to participate in these (e. g., planning suggestion to local authorities, participation in the local agenda of their home place),
- S9 work on an everyday basis for better environmental quality, sustainable development, intercultural understanding and peaceful co-existence in One World (e. g., purchase of fair trade and/or organic products, sponsorship, choice of means of transport, avoiding creating rubbish).

A4 Ability to reflect upon actions with regard to their effects on natural and social spaces

Students can

- S10 reason individual potential or actual actions in a geographical context,
- S11 assess the natural and social spatial consequences of selected individual actions and think of alternatives.

4 Sample assignments

4.1 Introduction

The sample assignments are intended to help to demonstrate and substantiate the standards, based on the six areas of competence with all their implications, as well as to illustrate the level of attainment required. They also demonstrate the considerable range of assignment types that can be used in geography. They should also show how standards are reached and competences tested and how the competences can be developed in classes. The design of the sample assignments is based on the following selected principles:

- integration of the topic in a context that is relevant to everyday life,
- focus on an issue or problem,
- step-by-step approach to the problem using interlinked subsidiary assignments,
- use of a range of possible assignment types used in geography,
- wording of the assignments as work sheets with operators,
- including all three performance levels,
- suitability to the standards required for the intermediate school certificate, i. e. year 9/10

Assignments of this type expand students' competence spectrum and encourage them to work more independently. The underlying principles of the sample assignments can be integrated into the design of tests, school exercises and exams and everyday teaching. The assignments are not primarily intended to be used directly as teaching material, but rather as inspiration for the development of competence-oriented exercises suited to their teaching and their specific student groups.

4.2 Subject-specific description of performance levels

In the absence of empirically verified performance level models, the performance levels used are in accordance with the German requirements (EPA) for the school-leaving examination Abitur. The performance levels are not characteristics or levels within a competence. Neither do they necessarily refer to one competence area. Instead they are characteristics of parts of assignments that indicate different levels of difficulty within a complex sample assignment. The three performance levels can be described as follows:

Performance level I (reproduction) includes the recounting and description of subject-specific contents from a clearly defined area and in a learned context with

the reproductive use of work techniques and procedures that have been practised. This calls primarily for reproductive skills.

Performance level II (reorganization and transfer) includes independent explanation, adaptation and ordering of subject-specific contents and the appropriate application of learned contents, methods and procedures to other issues. The main skills required are reorganization and transfer.

Performance level III (reflection and problem solving) calls for independent reflective engagement with new problems, the methods used as well as procedures and insights gained, in order to produce explanatory statements, interpretations, deductions and options for action. This calls for skills in reflection and problem-solving.

Fig. 1 shows how the performance levels could be applied in the six areas of competence. This preliminary schematization is likely to be replaced or further refined by performance level models in the near future.

		Areas of competence in the subject of geography					
		Subject-specific knowledge	Spatial orientation	Gathering information/ methods	Communication	Evaluation	Action
Performance levels (PLs)	PL I	Describe characteristics and facts	Describe location, read maps	Describe subject-specific methods	Present facts using geographical terminology	State criteria for evaluation	State fields of action and actors
	PL II	Explain how factors function and interconnections within systems	Analyse classification systems, explain map contents	Compare and apply subject-specific methods	Analyse and compare the logical, subject-specific and argumentative quality of statements	Apply criteria and geographical knowledge in evaluation	Explain and compare possible alternative actions
	PL III	Analyse systems; discuss and reflect on man-environment relations in a problem-specific way	Reflect on spatial perceptions and constructions; design cartographic presentations	Apply subject-specific methods in a manner appropriate to the issue in question; reflect on cognitive paths	Express subject-specific opinions in a discussion in a well-founded and target-oriented manner	Evaluate relevant facts and arguments on the basis of criteria, reflect on values	Reflect on the spatial effects of possible actions; justify, evaluate, and, where applicable, perform actions

Fig. 1 The relationship between performance levels and areas of competence

4.3 Converting the performance levels into operators

Among the above-mentioned principles for designing exercises is the target-oriented use of operators. This is obligatory in the senior cycle of secondary schools. Based on the existing list of operators for geography and an inspection of the operator lists for related subjects, the team has developed a proposal for a list of operators (see Fig. 2) and built its formulation of the elements of the sample assignments around this list.

Performance level I	
describe	Express statements and knowledge (about a given aspect) in the student's own words in a coherent and ordered manner and using geographical terminology
implement	Carry out analyses, experiments, field surveys, questionnaires based on specific instructions
locate	Identify / mark the location of a place, river etc. on a map or describe it in relation to other spatial features
name/list	Relate information and facts from given material or knowledge without commentary
record	Record observations or experiments performed in detail, in accurate drawings or using appropriate geographical terminology

Performance level II	
analyse	Analyse and interpret material or facts systematically and purposefully and identify structures
outline	Present facts, connections, methods and relations in a structured way and using an appropriate form of communication
classify/collate	Classify facts and spaces/places in a given context or collate them in a system, giving reasons
explain	Present information and facts (e. g. phenomena, developments) in such a way that conditions, causes, consequences and universal laws are readily apparent
illustrate	Describe facts in context and make relationships clear
design/draw	Present facts in a suitable graphic form and label these diagrams using geographical terminology (e. g. flow chart, diagram, sketch map, mind map, …)
plan	Design experiment instructions, a questionnaire or a spatial analysis for a problem or issue; plan their implementation
compare	Critically compare similarities and difference and formulate a result/ conclusion

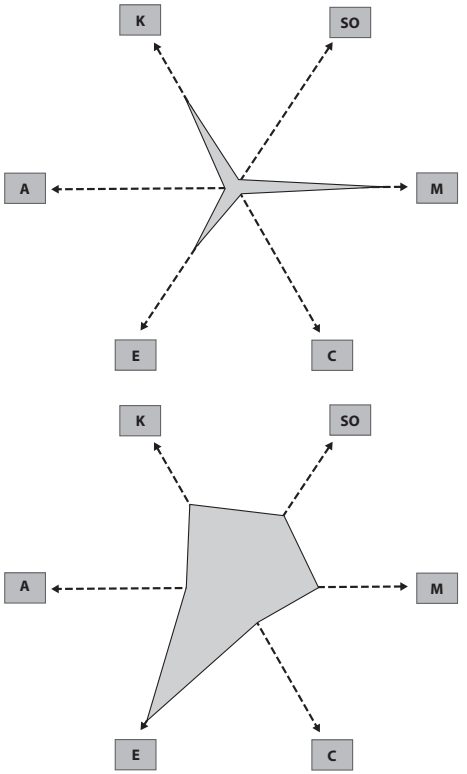
Performance level III	
reason	Develop logically argued complex concepts and present them in context
evaluate	Investigate the validity or suitability of statements, claims, suggestions or measures in their context, citing the criteria used, without expressing a personal opinion
comment on	Appraise statements, claims, suggestions or measures, making clear and reflecting upon the values underlying this appraisal, and expressing a personal opinion
develop	Link up facts and methods for a specific purpose, e. g. formulate a hypothesis, create a research plan, design a model
discuss	Make a reasoned judgment / formulate a reasoned opinion on a given issue by weighing up pro and contra arguments; synonym: discuss
assess	Analyse the internal coherence and suitability of given statements or claims, forms of presentation in relation to specific issues

Fig. 2 List of operators

4.4 The structure of the annotated sample assignments

As regards content, the focus of the assignments is stated in the title. This is followed by a description of the situation or problem for the students. Then the material is presented. The material is followed by the setting of tasks[1]. Finally model answers are provided. The suggested solutions represent a compromise between typical student style and scientific exactitude. The model answers demonstrate the weighting of competence areas and correlation with standards. They also highlight interconnections with other competence areas (see Fig. 3). The assignments are not always equal in scope or length. This is partly based on the purpose to identify competences as clearly as possible in the assignments and partly due to the complexity of geographical issues. In many cases, however, thematic areas are deliberately not covered in their full breadth in the same way that they could be taught in a series of lessons. Thus the assignments concentrate on one or two aspects of a theme (e. g. the origin of earthquakes) and do not take other aspects into account (e. g. effects and measures). Problems that are actually quite complex are treated selectively because it is only possible to treat limited aspects within a short span of time; the context and possible broadening of the assignments should always remain in view.

1 When using the assignments in a classroom situation, the students should first be given the tasks and then the material.



a) Assignment 10 "Soils", focus on the competence area gathering information/methods

b) Assignment 12 "Climate change", focus on the competence area evaluation

Assignment

Competence area
K = subject-specific knowledge; SO = spatial orientation; M = gathering information/methods;
C = communication; E = evaluation; A = action

(Designed by M. W. Hoffmann after Stäudel 2003, p. 16f)

Fig. 3 Spider chart for classifying and screening competence-oriented assignments

(Source : Stäudel, L.: Der Aufgabencheck. Überprüfen Sie Ihre „Aufgabenkultur". In: Aufgaben. Lernen fördern – Selbständigkeit entwickeln. Friedrich Jahresheft 2003. Seelze 2003, p. 16f)

4.5 The sample assignments in relation to the competence areas and basic concepts

The sample assignments are intended to provide examples of standard- and competence-oriented assignments in geography for the respective competence areas. The competence area focused on in each assignment (see Fig. 3) is evident from the assignment title. It should be kept in mind that – as a rule – a single assignment does not consider an entire competence area but rather elements of competences or individual standards. For this reason there are several examples for some competence areas. In the competence area of subject-specific knowledge, for example, each one of the five sample assignments targets one aspect of the competences in this area. Furthermore, the fundamental concept of the subject geography, the systems concept, with its subsidiary concepts structure, function, process, was taken into account in all of the assignments, although the emphasis varies between assignments. Thus Assignment 3 (globalization networks) is primarily concerned with structure, in Assignment 12 the focus is on function (global warming → rising sea-levels; rising sea-levels → consequences), and Assignment 2 concentrates on the process by which earthquakes occur. Assignments 4 (the use of snow guns) and 13 (the construction of dams) are designed to encourage comprehensive systematic thinking.

4.6 Creating the sample assignments

A public call for co-operation was initiated and a large number of sample assignments designed, discussed and revised. These assignments were then presented for discussion on the website of the University Association for Geographical Education from December 2006 to February 2007. Subsequently, 14 assignments that seemed most suitable were selected, tested in the classroom and further revised. They were then examined by university geographers and revised again.

The group is aware that, in spite of a high level of commitment and painstaking work, these sample assignments can only represent the current state of debate. Thus constructive criticism and improvement of the assignments in various directions is both possible and most welcome.

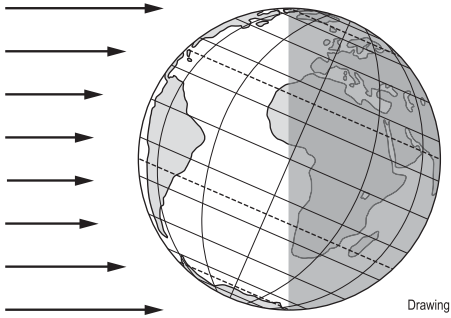
4.7 Overview of the sample assignments[1]

1 The following assignments are intended as examples for the applications of the educational standards. The term sample assignments commonly used in educational research and didactic debate is retained for reasons of uniformity.

1 Why are there seasons?

Situation/problem:
Christmastime is holiday time. Not just for us, but also for students in Australia. We look forward to the holidays and hope for a wintry white Christmas. But the Australians in Sydney pack their swimming things and look forward to summery holidays on the beach. What are the reasons for these differences?

M1 Illumination of the Earth on December 21st



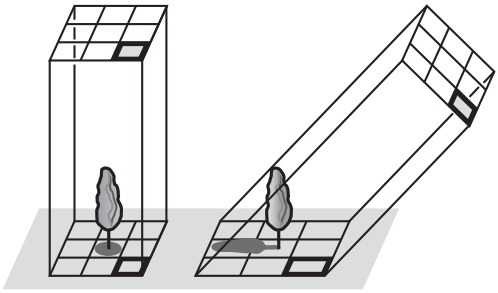
Drawing: C. Pietsch, 2012

M2 Angle of the sun’s rays (midday heights)

Location	21.12.	21.3.	21.6.	23.9.
North Pole	–	0°	23,5°	0°
50° N	16,5°	40°	63,5°	40°
Tropic of Cancer	43°	66,5°	90°	66,5°
Equator	66,5°	90°	66,5°	90°
Tropic of Capricorn	90°	66,5°	43°	66,5°
50° S	63,5°	40°	16,5°	40°
South Pole	23,5°	0°	–	0°

(Source: after: Seydlitz Baden-Württemberg, Geographie 3, Schroedel Braunschweig 2006, p. 97, Fig. 97.2)

M3 Distribution of radiant energy for different positions of the sun



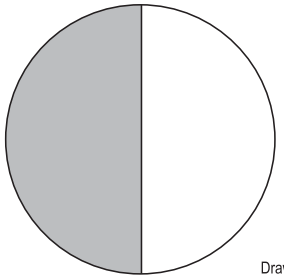
Drawing: C. Pietsch, 2012

(Source: after: Terra Baden-Württemberg GWG 3/4, Klett Leipzig 2006, p. 18, Fig. 8)

Exercises

1. Which of these statements explain why there are changes of season on the Earth?
   A The Earth rotates on its axis – rotation of the earth
   B The Earth rotates around the sun – revolution of the Earth
   C The sun rotates on its axis
   D The Earth’s axis is inclined at an angle of ca. 23 ½° from the perpendicular

2. Figure M1 shows the Earth on the 21st of December. Draw a corresponding diagram for the 21st of June. Use the sketch below and add the equator, the Earth’s axis, the polar circles and the rays of the sun, all labelled.

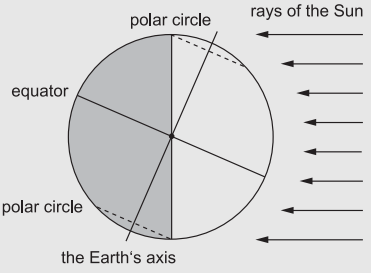


Drawing: C. Pietsch, 2012

3. Table M2 shows the angle of the sun’s rays for the northern and southern hemisphere and for the equator. Figure M3 shows the distribution of radiant energy for different positions of the sun.
   Use these materials to explain why Christmas occurs at different seasons in Australia and in Germany.

4. In 2004, French astronomers used complex computer simulations as the basis for predictions that the angle of the Earth’s axis will change by 0.4 degrees over the next six million years.
   Assume that the Earth’s axis is a) perpendicular and b) at an angle of 90 degrees to its orbit around the sun. Describe the effects on the seasons of such a change in the angle of the Earth’s axis for both a) and b).

Model answers

			Standards					
No.	Model answer	PL	**K**	SO	M	C	E	A
1	Correct answer: B and D	I	**2**			1		
2	Drawing of the equator, the Earth’s axis, the rays of the sun and the polar circles on the 21st of June 	II	**2**	2	6 8			

Continuation →

			Standards					
No.	Model answer	PL	**K**	SO	M	C	E	A
3	- Germany is located in the northern hemisphere, Australia in the southern hemisphere. - Around Christmas the angle of the sun’s rays in Germany is low. Their heating effect is small, because the radiant energy is spread over a large area. It is winter. - At the same time in Australia the angle of the sun’s rays is high. Heating is high, as a large amount of radiant energy falls on a small area. It is summer. - Due to the rotation of the Earth around the sun and the inclination of the Earth’s axis, the angle of the sun’s rays changes in the course of the year in the northern and southern hemisphere, which affects warming. This leads to the oppositional nature of the seasons in the two hemispheres.	II	**2**	1 2	4 6 7	2		
4	- If the Earth’s axis were vertical, the rays of the sun would always fall on the surface of the Earth at the same angle. There would be no seasons with different temperatures. Temperatures would be fairly similar throughout the year in every part of the Earth. - If the Earth’s axis were inclined at an angle of 90°, one hemisphere would still face the sun for part of the year and away for the rest of the year. However, the seasonal differences would be much more dramatic than they are today. The polar day on the 21st of June and the polar night on the 21st of December would not only occur within the polar circles but would extend as far as the equator. In general it can be said that the contrasts between seasons increase as the angle of inclination of the Earth’s axis increases, and decrease as the angle of inclination declines.	III	**2**			2		

PL = Performance level / K, SO, M, C, E, A = competence areas
The competence areas and standards focused on in the assignment are printed in bold type.

2 Earthquakes – why is Japan so much at risk?

Situation/problem:

Japan experiences more than one thousand earthquakes annually. In January 1995, the second largest economic region around Kobe and Osaka was devastated in only twenty seconds. More than 5000 people died. Why is Japan in particular so much at risk from earthquakes?

M1 Theory of plate tectonics explains earthquakes

On the 6th of January 1912, the German geoscientist Alfred Wegener presented am amazing hypothesis to the Geologische Vereinigung: The continents are not fixed in place but shift around the surface of the Earth! In the second half of the 20th century these ideas were developed into the theory of plate tectonics. According to this theory, the surface layer of the Earth is made up of plates consisting of the Earth’s crust and the upper mantle. These plates move, at an average speed of ca. 1-10 cm per annum. That is roughly the speed at which our fingernails grow.

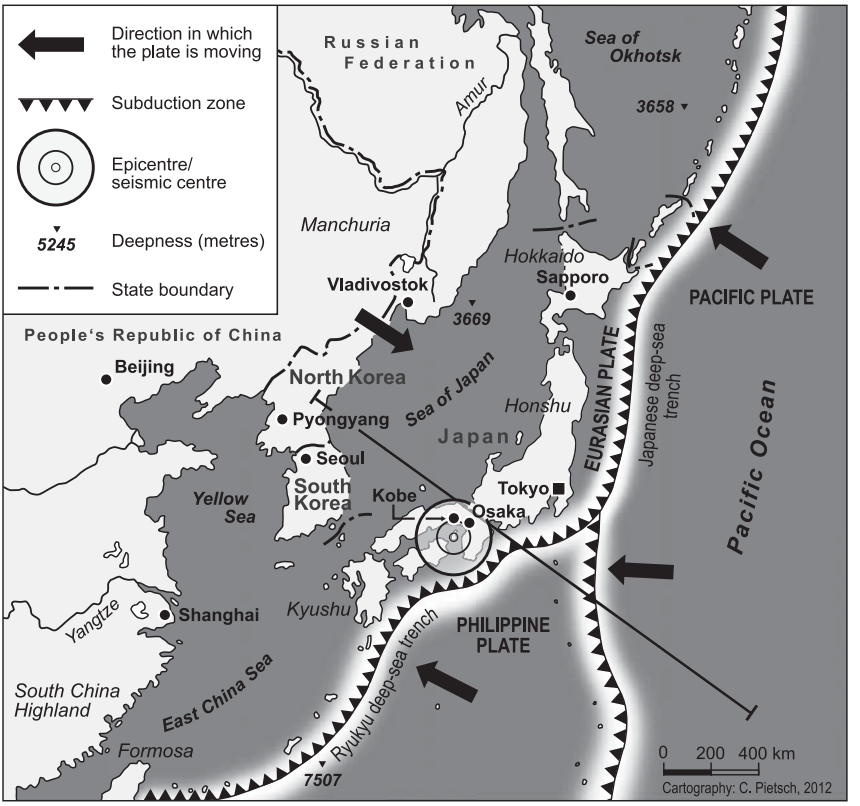
The Earth’s plates drift apart, together or alongside each other. In particular under the oceans along the mid-ocean ridges, the Earth’s plates are drifting apart. Here magma rises from the hot core of the Earth, hardens to form volcanic rock and forms new sections of the Earth’s oceanic crust. In the course of these movements, minor earth and seaquakes frequently occur. Two plates that are sliding along past each other frequently get stuck for a time. When the block is released, one plate may move very suddenly downwards, upwards or to one side, and an earthquake occurs. If two plates become unstuck under the ocean, a seaquake occurs, which in turn can cause a tidal wave or tsunami.

If two equally massive continental plates are moving towards each other, folded mountain ranges are formed where they meet. Where two oceanic plates meet, one will move beneath the other. An island arc composed of volcanic rock may form. In both cases blockages and tensions occur that can be released through earthquakes. The situation can be especially dramatic when two plates of different mass drift together and the heavier oceanic plate is pushed under the lighter continental plate. This process, whereby deep-sea trenches and volcanic chains develop above the descending plate, is known as subduction. Here the plates also shift and become blocked and severe earthquakes occur frequently. The descending section of the Earth’s crust sinks into the Earth’s interior.

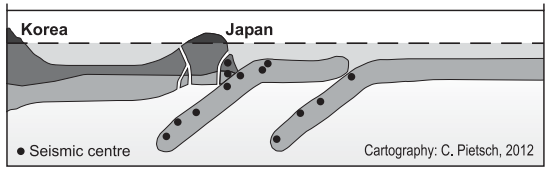
Plate tectonics theory also offers explanations for the movements of the Earth’s plates. The current state of research indicates that there are probably three factors that influence the transport of plates: Firstly the section of a plate that is descending into the interior of the Earth drags the entire plate in this direction; secondly ascending magma in the area of the oceanic ridge causes the plates to drift away from the elevated oceanic ridge in the direction of the deep-sea plain; thirdly the plates are moved by tremendous convection currents within the Earth’s mantle. These develop because the Earth’s core becomes so hot (at over 4000°) that the adjacent rock material is heated particularly intensely, expand and ascend. Close to the Earth’s surface it cools down again and descends.

(Sources: adapted form Bayrhuber, H./Hlawatsch, S. (eds.): System Erde. CD-Rom. IPN. Kiel, 2005; Frisch, W. & Meschede, M: Plattentektonik. Kontinentverschiebung und Gebirgsbildung. Darmstadt 2007)

M2 Geological overview of East Asia



(Sources: modified after Claaßen, K.: Hachinohe 1994, Kobe 1995, Tokio ????. In: Praxis Geographie 4/1995, S. 52; Frisch, W. & Meschede, M.: Plattentektonik. Darmstadt² 2007, Abb. 7.2, S. 100)



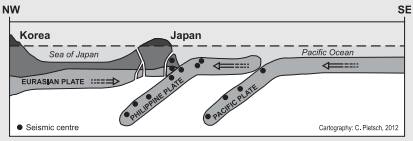
Exercises

1. a) With the help of a map from your atlas, describe the global distribution of earthquakes.
   b) Use the text M1 to explain the causes for the movements of the Earth's plates and how earthquakes occur.

2. Use the map and the section diagram in M2 to analyse the situation in Japan.
   a) Label the section diagram with points of the compass, plate names, oceans, and the directions in which the plates are moving. You will find the necessary information on the map.
   b) Use text M1 and the section diagram in M2 to explain why Japan is so frequently affected by severe earthquakes.

3. A major earthquake occurred in Peru in 2007. Find out if conditions here are similar to those in Japan (atlas).

Model answer

			Standards					
No.	Model answer	PL	**K**	SO	M	C	E	A
1	a) Earthquakes occur most frequently at the boundaries of tectonic plates. b) There are three causes for plate movement: drag force, sliding, convection currents. Earthquakes are caused most frequently at plate boundaries when blockages and tensions are released.	I II	**4** **4** **7**	1 2	4 4 6	1 2		
2	a) The section diagram is labelled with terminology and arrows.  b) Earthquakes occur so frequently in Japan because Japan is located exactly at the point where the Philippine plate and the Pacific plate descend beneath the Eurasian plate.	II II	**4** **4** **7**	6	8 4 7	 2		
3	Yes, they are both plate boundaries with subduction zones and deep-sea trenches. At the west coast of South America the oceanic Nazca plate descends from the west under the continental South American plate. However, Japan is an island arc on a continental crust, while the Andes are located on an active continental boundary.	II–III	**5** **9**		7	2		

PL = Performance level / K, SO, M, C, E, A = competence areas
The competence areas and standards focused on in the assignment are printed in bold type.

3 The BMW Group – a global player

Situation/problem:
As globalization proceeds, the division of labour is becoming increasingly international. The causes and consequences of the globalization process are many-faceted. Large concerns such as BMW have become so-called global players. What does this term mean and how does globalization affect the BMW Group?

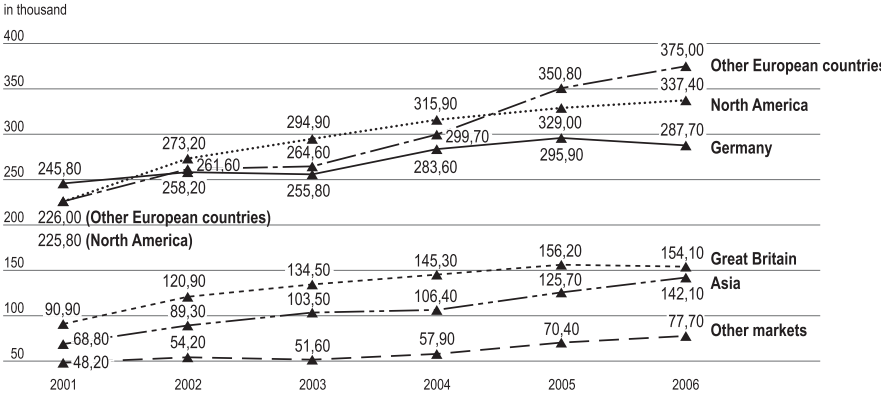
M1 Worldwide network of the BMW Group

Headquarters	
Research & Development	
Production	
Assembly	

Other Locations in Europe:	Research & Development	Production
Germany	4	7
Austria	1	1
Great Britain	0	4

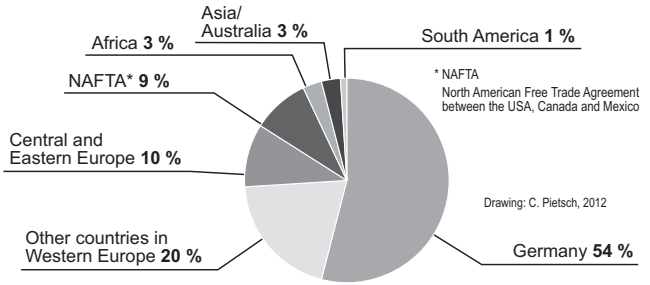
(Source: data from Annual Report of the BMW Group 2006)

M2 BMW Group: Car deliveries by region in thousands



(Source: data from Annual Report of the BMW Group 2006)

M3 Regional distribution of production supplies in %



(Source: data from Annual Report of the BMW Group 2006)

Exercises

1. a) Using M1, describe the international network of the BMW Group.
   b) BMW has had a branch in China since 2003, one was opened in India in 2007. With the help of M1 and M2, explain why BMW chose these two countries.

2. a) Explain why BMW is referred to as a global player (M1-M3)
   b) On the basis of your explanation, evaluate the following statement: *“The global player BMW benefits from globalization.”*

Model answers

No.	Model answer	PL	Standards K	SO	M	C	E	A
1	a) Spatial distribution and structure of the network (M1): - Company headquarters in Munich - Research and development in Western Europe, North America, East Asia - Assembly and production sites on five continents with the emphasis on Germany and England. - Assembly sites mostly in Asia	I	**10**	1 6	4			
	b) - Deliveries of cars to Asia doubled from 2001 to 2006. Thus the Asian market is a growing one. - BMW already has sites in Asia. - India and China are highly populated countries with very dynamic economies. - An increase in general purchasing power and major new customer potential can be expected there.	II	**10** **12**		4 7	2		
2	a) BMW has a global production network and markets its products worldwide. The materials used in production are purchased worldwide.	II III	**10** **13**	1	4	2 2	 2	
	b) The following arguments are to be expected: BMW benefits because - a large proportion of its turnover is achieved abroad; - future increases in car sales are not to be expected in Germany, but worldwide; - BMW establishes itself early in new markets and thereby increases its sales; - purchasing (of materials) abroad saves money; - due to globalization, a network has developed that brings advantages for production and development. Students’ answers pointing out that the BMW Group’s employees do not automatically benefit could lead to a more differentiated further treatment of globalization.		**14**					

PL = Performance level / K, SO, M, C, E, A = competence areas
The competence areas and standards focused on in the assignment are printed in bold type.

4 Snow at any cost? The use of snow guns in Alpine tourist regions

Situation/problem:

Tourists who travel to the Alps to ski prefer skiing regions that guarantee snow. This is achieved with the aid of snow guns in ca. 90% of the major skiing regions in the Alps. While there were severe conflicts over artificial snow production about ten years ago, it is widely accepted today. But what effects has artificial snow production on man and nature in the Alpine regions?

M1 Snow guns

At temperatures of -12° and relative humidity levels of 60%, a large snow gun can cover a hectare of ski-slopes with 25cm of snow in only twelve hours. To do this it requires more than a million litres of water and, depending on the system used, the location and the nature of the water, 8 to 10 megawatt-hours of energy, i.e. roughly the same amount used in an entire year by a household of two to four persons. The snow guns are often used at night, as a propeller gun is louder than a lorry and some high-pressure systems are even noisier than a pneumatic drill. Artificial snow is denser than natural snow, is four to five times heavier and is less permeable.

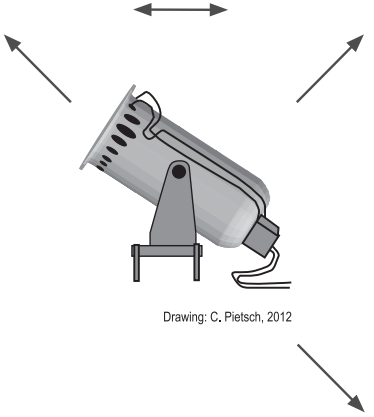
(Source: adapted from Werl, B.: Lautstark rieselt der Schnee. In: Spektrum direkt, 09.12.2006 [www.wissenschaft-online.de/artikel/859719]; retrieved 20.06.2012)

Exercises

1. Describe some positive effects that the use of snow guns can have for tourism and the population of an Alpine tourist location.

2. Using M1, explain how the use of snow guns and artificial snow affects soils, the water budget and flora and fauna. Take into account the fact that the growing season becomes shorter as elevation increases.

3. With the help of the diagram below, create a concept map for the effects that the use of snow guns in a tourist region has on man and nature. Mark individual cause-and-effect connections with arrows (→) and the relationships and interactions between different factors with double arrows (↔). Outline positive effects with a green circle and negative effects with a red circle



Drawing: C. Pietsch, 2012

4. “Tourism in the Alps depends on the use of snow guns.” Evaluate this statement and give your own opinion on it.

Model answers

No.	Model answer	PL	Standards K	SO	M	C	E	A
1	The use of snow guns guarantees snow cover and can help to lengthen the winter season, it secures the livelihood and income of lift operators, hoteliers, restaurant- and hut-owners as well as many other people who live directly or indirectly off tourism.	I	**11**					
2	Possible students’ answers: - Artificial snow is four to five times heavier than natural snow. Soil compaction leads to increased run-off and a greater risk of erosion. - At times when water is in short supply, immense amounts of water are taken from mountain streams, springs and reservoirs for the snow guns. - Because of the shortened growing season in an already sensitive ecosystem, the plants have limited scope to regenerate and form fruit and seeds. - Noise exposure is a major disruptive stress factor for animals that sleep at night as well as for animals that forage at night. The extended period of snow cover and the reduced time available for plants to grow in turn reduce the supply of food.	II	**6** **18** **19**		6 7	2		
3	The students are expected to be able to present the aspects listed under 1 and 2 in graphic form. As well as simple causal chains (e. g. guaranteed snow → tourists → income for hotels and restaurants), interactions between individual factors should be emphasised by arrows (e. g. plants ↔ animals). In this way the interrelations between human and physical geographical factors should become apparent. It is also clear that any single aspect can have both positive and negative effect (e. g. the consequences of the lengthened tourist season – for the inhabitants of a tourist region and for its flora).	II	**8** **13** **17**			4		

Continuation →

			Standards					
No.	Model answer	PL	**K**	SO	M	C	E	A
4	Depending on value systems and perspectives, the statement “Tourism in the Alps depends on the use of snow guns” can be evaluated in quite different ways. The students’ own opinion should be supported by considering the different effects, describing the value system applied and possibly by critical values or alternative forms of tourism in the Alpine region.	III				2	2 7 8	

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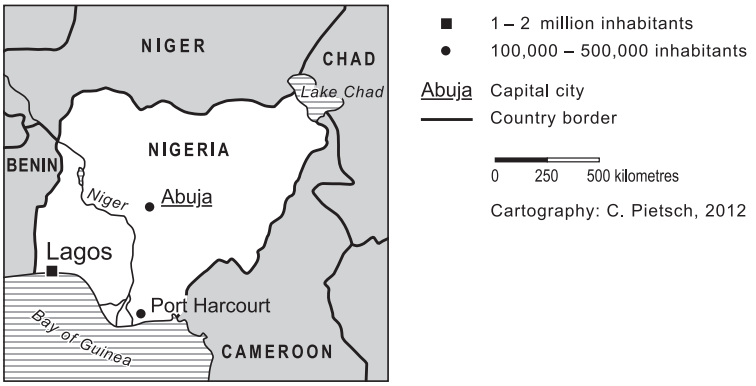
The competence areas and standards focused on in the assignment are printed in bold type.

5 Spatial analysis – the example of Nigeria[1]

Situation/problem:
Nigeria has the highest population of all countries in Africa and owns the continent’s largest reserves of oil. From 1956 on, this provided a great opportunity for economic development and prosperity for the population. Nobody expected to find the following headlines about this country by the end of the 20th century: “Government moves to the new capital Abuja (1991)”, “Tribal fighting in Nigeria”, “The curse of oil. Nigeria descends into chaos”, “Attacks on Shell oil rigs”, “Since the oil began to flow, living standards have fallen in most places”, “Oil wealth brings poverty”.

M1 Nigeria – general map



M2 Basic facts about Nigeria

Area	923,768 km²
Population (2006)	134.5 million
Population (2050; estimate)	298 million
Growth rate (2006)	2.4 %
Average number of children per woman	6
Age structure	43 % under 15; 3 % over 65
Average life expectancy (2006)	44 years
Infant mortality (2006)	10 %

Continuation →

1 see footnote on p. 54

Ethnic groups	Hausa, Fulbe, Yoruba and Ibo (together 65 %) Other ethnic groups
Religious affiliation	Muslim 50 %, Christian 40 % Traditional religions 10 %
GNP/capita	US$ 350
Real GNP/capita (PPP) (2004)	US$ 970
Proportion of the population with less than US$ 2/ day	91 %
Employment in agriculture	33 %
Exports	90 % oil

(Sources: DSW – Datenreport Weltbevölkerung 2006; Der Fischer Weltalmanach 2007)

Exercises

1. Describe Nigeria’s location and size (atlas; M1).

2. You have to brief your classmates about Nigeria and want to find out more about this country.
   a) With the help of the headlines quoted in the introductory description of the situation/problem and the materials M1 and M2, formulate several possible questions about this country for which you would like to find answers.
   b) Choose one question that you find interesting and important and design a work plan in the form of a table in order to answer this question. Select facts and methods in accordance with your question.

To help you, three examples are given here:

Facts	Methods
Surface forms	Analysis of physical map
Population groups	Encyclopaedia or internet search
Oil deposits	Analysis of economic map

…

3. Analyse the individual facts in relation to your question and identify connections and relationships.

4. Design a poster showing the results of your analysis of Nigeria in the context of your question.

5. Name and explain at least one subsequent question arising from your research.

6. Assess your own work by noting key words, the steps you took, problems that arose and what you would do differently the next time.

Model answers[1]

			Standards					
No.	Model answers	PL	**K**	SO	M	C	E	A
1	*Location:* in West Africa, bounds on the Gulf of Guinea in the south, Benin in the west, Niger in the north, Chad in the northeast, Cameroon in the east; grid location: between 13°N and 4°N / 3°E and 15°E (rounded, determined using an atlas map) *Extent:* N-S ca. 1000 km, W-O ca. 1400 km	I		1 2 3 4	2 4	1		
2	a) *Possible questions:* - Why are people in Nigeria so poor in spite of the country’s rich reserves of oil, and what are the consequences of this poverty? - Why are different population groups fighting each other? - Why are so many children born and what consequences does this have for the country? - What role is played by Shell? - … b) *Selection:* The first of the above questions arises directly from the materials provided and is comprehensive enough to carry out a question-led spatial analysis. However, the other questions also point to many interconnections. The work plan should be designed in accordance with the question selected.	II	**10** **17** **13** **18** **19** **22** **22**		4 7 9 4 9 10 11	1 2 2 4		4 5

Continuation →

1 see footnote on p. 54

No.	Model answers	PL	Standards K	SO	M	C	E	A
3	Analysis of possible relevant facts (in particular geofactors) and connections between them, depending on the question, e. g.: Natural factors: Relief, climate, drainage network, vegetation, soils, resources History (especially during the colonial period and afterwards) Political situation: System of government, property structures, power relations Population: Population change, including age structure, fertility rates and reasons for their high levels, life expectancy Socioeconomic characteristics: Employment structure, informal sector, income relations, unemployment, other living conditions: nutrition, health, housing, education, crime Ethnic structure: distribution and characteristics of the population groups, attitudes to each other, shari’ah/Islamic law; migration Settlement: Structure and distribution, condition Agriculture: main cultivated areas and crops, income, prices, food supply, state of development of agriculture Industry, in particular the oil sector: development, structure, locational distribution Oil: ownership structures, division of profits, production, transport, processing, share of exports, prices Transport: connections to international networks, transport networks in the interior Environmental problems: countrywide, but especially in the Niger delta – the effects of oil production on the environment and the population *Connections:* usually 2-3 factors, e. g. climate – soils – agricultural land-use; economic potential of a country – distribution of ethnic groups – employment	II	**10** **11** **12** **13** **14** **15** **17** **18** **19** **23**	2 3 4 6	4 6 7	1 2	1 2 3	4 5

Continuation →

No.	Model answers	PL	Standards K	SO	M	C	E	A
4	*Synthesis:* For example, answer to the question: poverty in spite of oil wealth? Depiction of circumstances and interrelationships (for example – could be shown using concept maps), e. g. Ownership patterns in the oil sector (state company and multinational concerns) and distribution of profits: - Inequality in state support for different parts of the country - Investment mainly in industry and infrastructure, new capital - Corruption - … Structural change in the agricultural sector - Export crops, food imported, price increases - Migration into environmentally challenged industrial regions - … Rapid population growth leading to a growing demand for food, housing, employment and education …	II	**10** **17** **13** **18** **19** **23**		7 8	4	7 8	10
5	*Possible questions:* e. g. - What are Nigeria’s prospects for the future? - How can poverty be overcome?	II	**22**		9			
6	*Reflection:* In accordance with the students’ experience	III			11			

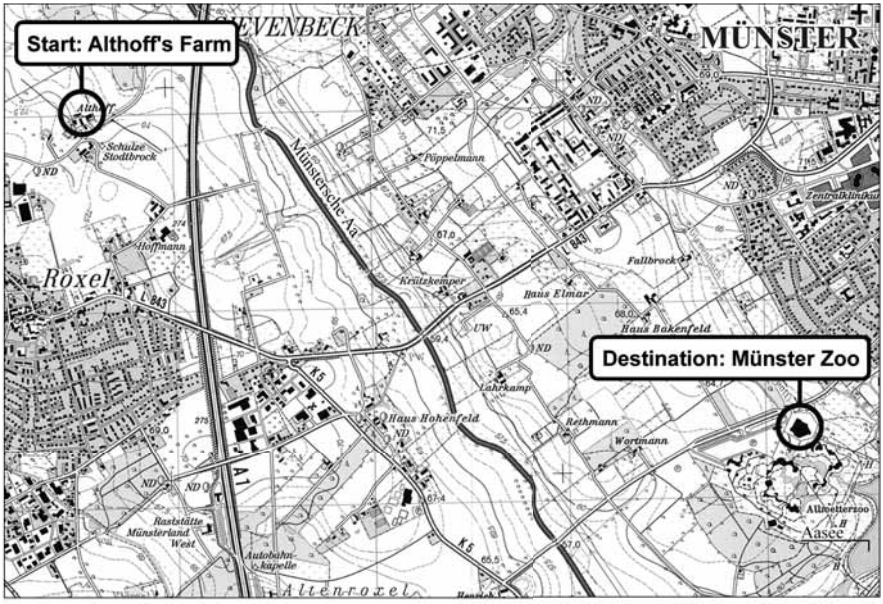
PL = Performance level / K, SO, M, C, E, A = competence areas
The competence areas and standards focused on in the assignment are printed in bold type.

1 The task of carrying out a spatial analysis is a specific example of one possible way of practising problem-oriented regional geography. It is relatively complex and is usually carried out in the form of a student presentation or group work over several classroom periods. The problems/questions to be dealt with should be chosen and formulated by the students themselves.

6 Using a map to get to an open air festival[1]

Situation/problem:
You and your friends are planning to visit an open air festival at the Aa Lake near Münster. You are going to meet at a friend’s place (Althoff’s farm) and plan to sleep there. To prevent your bicycles being stolen, you decide to walk to the festival from your friend’s home. Mr. Althoff promises to collect you with his car after the concert. Some of your friends are coming by bus from Münster. You plan to meet them at the bus stop for Münster Zoo and will then go to the lake together from there. Which route is suitable and how much time should you allow to get there?

M1 Topographic map



Map base: TK 25, Sheet 4011 Münster, 6th ed. 2003; reduced. Cartography: C. Pietsch, 2012.

1 For use in the classroom it is recommended to adapt the example with local/regional information.

Exercises

1. You start at Althoff’s farm. Describe the location of the farm by filling in the correct points of the compass and distances.
   a) Althoff’s farm is to the …….. of Roxel village and is about ..... metres from the centre of the village/church.
   b) Althoff’s farm is ca. ..... metres to the east ( ), west ( ), north ( ), south ( ) of the motorway.

2. Sketch a suitable route in the form of a separate sketch map. Bear in mind: The route to the Zoo should include as few major roads, i.e. national, main or secondary roads, as possible. Furthermore, a picnic break at the River Aa should be included in the plan.

3. Write a small “route guide” for your friends with marked points and route sections that you can email them in advance. Provide information about distance as the crow flies, the actual distances of the route and the time required for the entire route, as well as distances, directions (N, S, E or W) and time required for the individual sections of the route.

Model answer

No.	Model answer	PL	K	Standards SO	M	C	E	A
1	a) north, 1000 m b) 500 m, west	I		**6**	6			
2	The students identify a suitable route on the map and produce a sketch map. Several fairly similar variants are possible.	II		**6** **8**	6			
3	The students develop a route guide that could include the following information: *Entire route:* Ca. 4 km as the crow flies; actual distance on the ground ca. 6 km; time required: ca. 1.5 hours (not including break) *Sections of the route:* - Althoff-Autobahnbrücke: Althoff – motorway flyover: ca. 800m; go SE, ca. 10 mins. - Motorway flyover – small bridge on the Aa: ca. 2.5 km, first go E as far as the end of the path, then S to secondary road L 843 (Roxel - Münster), then follow this road E as far as the Aa bridge; ca. 35 mins. (break) - Small bridge – Rethmann’s farm: ca. 1.2 km; first continue NE on the secondary road, then after ca. 500 m turn right at a crossroads into the path to SSE; ca. 20 mins. - Rethmann’s farm – zoo: ca. 1.5 km; first go 500 m farther SSE along the path, at the crossroads turn NE onto the road towards Münster; ca. 25 mins.	III		**6** **12**		4		

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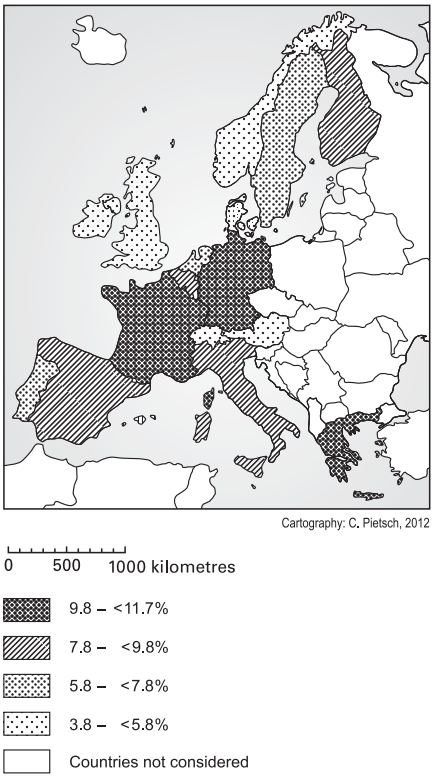
7 One topic – many maps: Unemployment in Europe

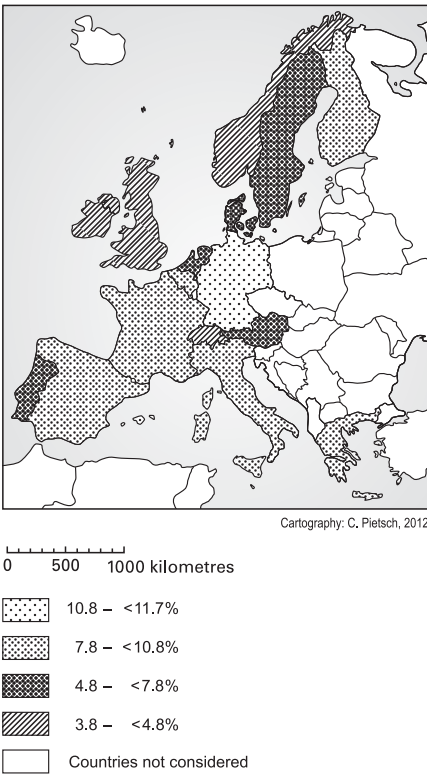
Situation/Problem:
Maps provide a thematic view of the world. The map is created by one person and looked at by others. There are different ways of drawing a map. Even when a cartographer has chosen a particular way, there is still scope to produce very different effects. Information can be presented, for example, in a dramatic or a moderate style. What effect was the cartographer aiming for in these maps of unemployment in selected European countries?

M1 Unemployed as a percentage of the total population (2005)

a)



b)



M2 Unemployment in selected European countries (2005)

	in 1000s	in %		in 1000s	in %
Belgium	875	8.4	Italy	4,491	7.8
Denmark	303	5.6	Netherlands	1,058	6.5
Germany	9,654	11.7	Norway	197	4.3
Finland	439	8.4	Austria	422	5.2
France	5,917	9.8	Portugal	798	7.6
Greece	1,150	10.4	Sweden	531	5.9
Great Britain	2,814	4.7	Switzerland	281	3.8
Ireland	179	4.4	Spain	3,928	9.2

(Source: Der Fischer Weltalmanach 2007, Frankfurt 2006. pp. 74-449)

M3 Map of Europe

a)

b)

Exercises

1. M1 shows the proportion of unemployed in relation to the population as a whole in selected European countries in 2005.
   a) Compare the two maps. Note similarities and describe differences.
   b) Explain the effects that the two different ways of presenting the information have.

2. Now create a map of your own on the same topic. Graphics software may be used if available.
   a) Complete the first map in M3. Use the percentage figures given in Table M2. Use the classification from the key for map M1 b) but choose different shading or different colours.
   b) Compare your map with maps M1 a) and b) and explain the possible advantages of each format.

3. Create another map on unemployment.
   a) Complete the second map in M3. This time use the absolute figures from M2. Use shading or colours and decide on your own classification for the key.
   b) Compare this map with your first map. Observe what effect the map has when absolute numbers are used as its base.

4. One theme, several maps. Give a brief summary of how the statement made by a map can be influenced and give reasons for the importance of the map’s key.

Model answers

No.	Model answer	PL	K	Standards SO	M	C	E	A
1	a) *Similarities:* the same countries selected, shading, four categories. *Differences:* different classification, different allocation of shading to classification categories. b) Map 1a has the effect that Germany, France and Greece stand out. The key makes it clear that these are the countries with the highest rates of unemployment. The design of map 1b suggests that unemployment is high in Denmark, the Netherlands, Austria, Poland and Sweden, and low in Germany. The reader is confused by the choice of shading, because the visual impression is contrary to the actual situation. The different classification in Map 1b), together with the shading, gives the impression that unemployment is low in large parts of Europe, because more countries fall into the second category with the paler shading.	II II		**6** **7**	4 6		 4	
2	a) The result depends on the students’ decision. The exercise encourages experimentation. b) The comparison depends on the result from 2a.	II II		**8** **6** **7**	8		 4	
3	a) The result depends on the students’ decision. The exercise encourages experimentation. b) The comparison proves the statement that the choice of absolute figures produces a different ranking of countries/unemployment. The choice of percentages or absolute numbers is in itself a ‘manipulation’ of the map’s statement.	II II		**8** **6** **7**	8		 4	
4	It is possible to influence the statement made by a map through the selection of data, their classification, and the choice of cartographic symbols. It is very important to read the key to a map very carefully in order to evaluate it.	III		**6** **7**		2		

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8 GIS: The European Union – a universal success story?[1]

Situation/problem:

Two exchange students in conversation

VIOLA: “Lots of people say that the European Union (EU) is a remarkable success story. Is that really true?”

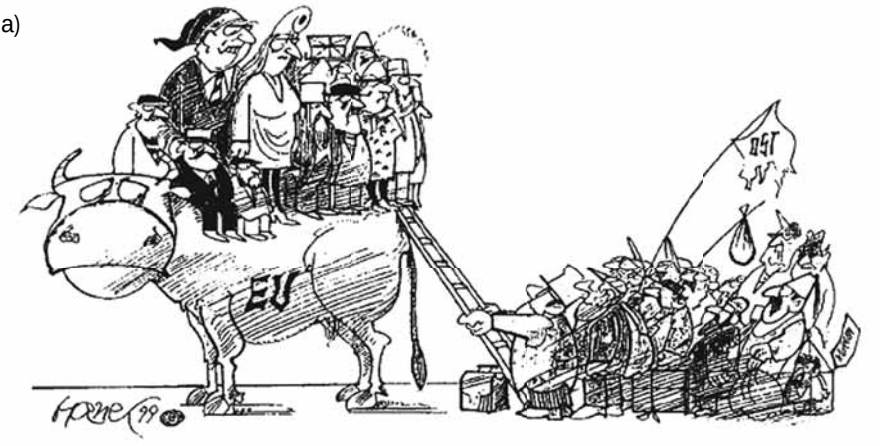
HANNA: “You can read it here in the newspaper. Since the 1st of January 2007, 27 states belong to the EU. Its story began in 1957, when six states with a total population of 168 million came together to form the European Economic Community (EEC). Today about 490 million people live in the EU in an area of 4,279 million km². With a GDP of over 11 trillion euros, the EU is the biggest internal market in the world” (Handelsblatt 23/24/25 March 2007).

VIOLA: “Yes, that does sound like a success story. The EU is an economic giant and has developed from the six founding states into the world’s largest international market. But critics claim that there are still differences in wealth between the member states of the EU. And there are major regional differences within the member states.”

HANNA: “In this context, geographers speak of disparities. How can we investigate these differences, the economic and social disparities within the EU? Can you measure wealth?”

M1 The expansion of the EU

a)



Cartoon: Walter Hanel 1999

1 see footnote on p. 64

b) Today the EU has 27 member states. From 2004 to 2007 twelve new states joined what had been the EU 15: Bulgaria, Estonia, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, the Czech Republic, Hungary and Cyprus.

Exercises

1. The media often report controversially about the expansion and integration of the EU and the advantages and disadvantages of EU membership. Describe and explain the caricature in M1.

2. On the website http://webgis.bildung-rp.de/kartendienste/europa.html[1] you will find the map service “Europäische Union 2007”.
   a) Use it to create a table for the 12 new member states showing GDP per capita for 2010 in purchasing power standards PPS and calculate the average value.
   b) Compare this value with the average values of the EU 15: 30,153 GDP per capita in PPS and the EU 27: 24,037 GDP per capita in PPS.

3. Use the function “attribute prompt” to create a map of the countries in the EU 27 (at NUTS_0 level) that are below your calculated EU average value for the twelve new countries. First calculate the number of people below this average economic strength and then analyse your newly created map.

4. Use the function “attribute prompt” to create a map of the countries in the EU 27 that are above the EU 27 average value and analyse the map you have created.

5. The differences are even greater at the level of the EU 27 NUTS_1 regions. With the aid of appropriate “attribute prompts”, test the following statement: “Agricultural regions and peripheral areas are among the most economically underdeveloped areas, while the capital regions have better values!” When creating your map use the variable names primary sector (PRI04_PZ) and “unemployment rate” (AL05).

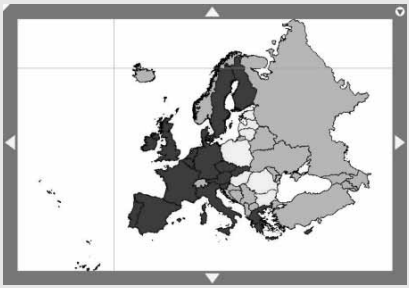
1 This website will be translated into English in the near future.

Model answers[1]

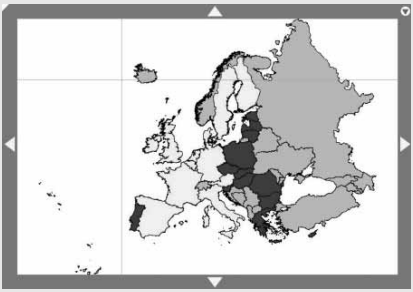
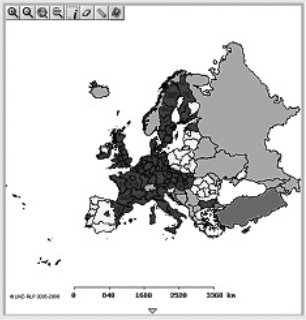
<table>
<tr><th rowspan="2">No.</th><th rowspan="2">Model answer</th><th rowspan="2">PL</th><th colspan="6">Standards</th></tr>
<tr><th>K</th><th>SO</th><th>M</th><th>C</th><th>E</th><th>A</th></tr>
<tr><td>1</td><td>Description and explanation of the cartoon:
- Picture divided in two (upstairs/downstairs or West/East …)
- Bull is a classical symbol of Europe; Europe (the bull’s back) is full
- People look sceptical (see e. g. the stereotypical images of Germans and French …)
- The flag of the candidates from the East is tattered; candidates stand lower down and all want to be taken in together (onto the bull’s back); they bring very little with them (in the bundle);
- The image appears static, without movement, no movement towards each other; the candidates have to climb the ladder on their own, without outside help.</td><td>I-II</td><td>12</td><td></td><td>4
6</td><td></td><td></td><td></td></tr>
<tr><td>2</td><td>a) GDP per capita of the 12 new member states in PPS 2010 (see NUTS_0 level):
<table><tr><th>Country</th><th>BIPPE10KKS[2]</th></tr><tr><td>Cyprus</td><td>23,200</td></tr><tr><td>Slovenia</td><td>20,700</td></tr><tr><td>Malta</td><td>20,100</td></tr><tr><td>Czech Republic</td><td>19,400</td></tr><tr><td>Slovakia</td><td>17,900</td></tr><tr><td>Hungary</td><td>15,800</td></tr><tr><td>Estonia</td><td>15,700</td></tr><tr><td>Poland</td><td>15,300</td></tr><tr><td>Lithuania</td><td>14 000</td></tr><tr><td>Latvia</td><td>12 500</td></tr><tr><td>Romania</td><td>11,400</td></tr><tr><td>Bulgaria</td><td>10,700</td></tr></table></td><td>II</td><td>10
12</td><td>10</td><td>6
7
8</td><td></td><td></td><td></td></tr>
</table>

Continuation →

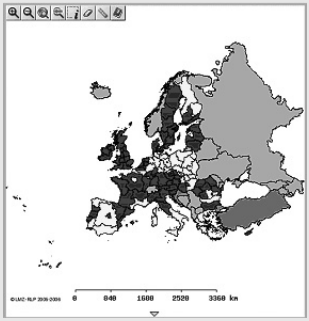
1 The exercise covers the two competence areas “spatial orientation” and “acquisition of knowledge/ methodology”.
2 GDP per capita 2010 in purchasing power standards.

No.	Model answer	PL	Standards K	SO	M	C	E	A
	b) The calculated average is ca. 16,392. It corresponds to “only” ca. 55% of the EU 15 average or “only” 68 % of the EU 27 average – a clear and numerical reflection of a West-East contrast (“wealth gap”) within the EU 27.							
3	Result of calculations: In the EU 27 a total of 84,125,089 people (2010) live below the average value for the twelve new member states. That is over a sixth of the entire population (16,5 %) of the EU 27 (ca. 500 million inhabitants). Map (BIPPE10KKS): Map of countries below the average for the 12 new member states.  Notes for analysis: The results of the website query are shown in yellow. - Six of the twelve new states are shown; - Bulgaria and Romania, who only joined the EU in 2007, are shown; - The countries with the lowest purchasing power are located at the eastern periphery of the Union; - Transition from command economies in reform states (transformation).	II	10 12	**10**	7 8		3	

Continuation →

No.	Model answer	PL	Standards K	SO	M	C	E	A
4	Map (BIPPE10KKS): Map of countries above the EU 27 average:  Notes for analysis: - 13 countries are shown; - No country from the twelve most recent members is included; - The eastern and southern periphery do not feature (compare Portugal and Greece from the former EU 15; Cyprus); - At this level (EU 27 NUTS_0) a central “wealthy” zone (NS axis) is clearly shown; - A centre-periphery contrast becomes apparent here.	II	10 12	**10**	6 7 8		3	
5	A query on the website using the prompt “Primary Sector > 9 %” produces the following map: 	III	10 11	**10**	6 7 8		3	

Continuation →

Nr.	Model answer	PL	K	**SO**	M	C	E	A
		Standards						
	Notes for analysis (selected): - Predominantly agricultural regions coincide with those countries that are below the EU 27 average (GDPPC10PPS); - The peripheral regions of the EU 27 have the most predominantly agricultural economies; - etc. A query using the prompt “Unemployment rate > 9%” produces the following map:  Notes for analysis (selected): - High unemployment is shown in “passive” economic areas: in the West (Spain, Portugal), North (Finland), South (Italy’s mezzogiorno, Balkan peninsula, Greece) and especially in the East (former Eastern bloc); - Active zone extends from northern Italy through southern and western Germany and the Benelux state to England and Ireland; - Cities and their hinterlands are active economic zones; - etc.							

PL = Performance level / K, SO, M, C, E, A = competence areas
The competence areas and standards focused on in the assignment are printed in bold type.

9 When does Warsaw have the least rain?

Situation/problem:
A school in Hamburg has a twin school in Warsaw. An exchange is planned for the coming year. In order to be able to do as much as possible, the students want to travel at a time when pleasant temperatures and little rain are to be expected. Which months are most suitable?

M1 Temperature and precipitation in Warsaw and Hamburg

	J	F	M	A	M	J	J	A	S	O	N	D	Year
Warsaw (107 m AMSL)													
T in °C	-3.5	-2.5	1.4	8.0	14.0	17.5	19.2	18.2	13.9	8.1	3.0	-0.6	8.1
P in mm	23	26	24	36	44	62	79	65	41	35	37	30	502
Hamburg (13 m AMSL)													
T in °C	0.4	0.6	3.3	7.1	11.8	15.5	16.6	16.3	13.4	9.4	5.0	2.0	8.4
P in mm	56	40	44	47	55	70	87	84	68	58	64	71	744

(Sources: Sträßer, M.: Klimadiagramme und Klimadaten. Duisburger Geographische Schriften 10. Dortmund 1993. p. 75; Sträßer, M.: Klimadiagramme zur Köppenschen Klimaklassifikation. Stuttgart 1998. p. 75)

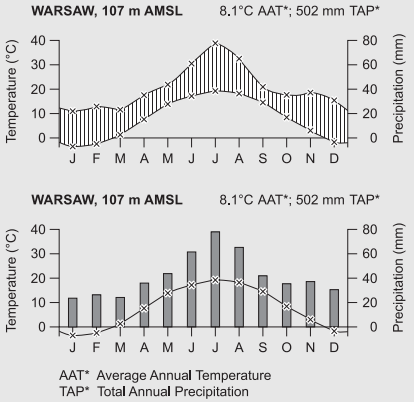
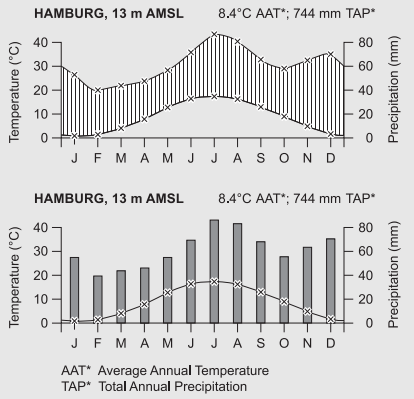
Exercises

1. You want to present Warsaw’s climatic data in a compact and clear form. Create a climate diagram with all the necessary data. For the y axis use the following units of measurement: 1 cm = 10 degrees = 20 mm and for the x axis: 1 cm = 1 month.
2. For your final decision it is important to compare the data for Warsaw with conditions at home in Hamburg. Create a second climate diagram for Hamburg.

3. Compare the two diagrams for both cities and describe the features of each climate. Then decide on the best time to visit Warsaw. Note: Polish school holidays are from the end of June to the end of August.

4. Bearing in mind the way in which climate data are gathered, explain how certain the students can be that there will actually be very little rain at this time in the coming year.

Model answers

No.	Model answer	PL	Standards K	SO	**M**	C	E	A
1	The students create a climate diagramm based on Table M1. They are free to show precipitation using columns (Köppen) or a curve (Walter/Lieth).  	II			**4** **8**			
2	The students create a similar climate diagramm for Hamburg. If appropriate the tasks can be shared out among work groups.  	II			**4** **8**			

Continuation →

No.	Model answers	PL	Standards K	S	**M**	C	E	A
3	Comparison of the diagrams: *Similarities:* Fairly similar annual patterns and the same average temperature: moderate climate, the precipitation curve/columns is/are above the temperature curve all year round: humid climate *Differences:* Warsaw: lower precipitation, warmer summer, colder winter, greater temperature range between warmest and coldest month (22.7°): Continental climate Hamburg: relatively high precipitation, cooler summer, milder winter, smaller temperature range between warmest and coldest month (16.2°): Maritime climate Both situations do not have a very pronounced maritime or continental climate, they are transitional. *Best time for a trip to Warsaw:* Description of the temperature and precipitation minima and maxima, consideration of the relative advantages of May, June, September	II	4 6	2 4	**4** **6** **7**	2		
4	The values given in the table are monthly averages (temperatures) and monthly totals (precipitation), averaged over a long period of time (e. g. 1930-1960). Thus there is no guarantee that there actually will be very little rain in the planned time for the trip, but the probability is quite high.	III			**3** **7**			

PL = Performance level / K, SO, M, C, E, A = competence areas
The competence areas and standards focused on in the assignment are printed in bold type.

10 Experiment: Soils – an endangered essential resource?!

Situation/problem:
Soils are man’s most essential resource. We use them in many ways, e. g. in agriculture or as building-ground. However, in recent decades it has emerged that man’s use creates problems that change the soil as an important part of ecosystems and reduce or endanger its usability. What effects can be observed?

M1 Field after rain

(Photograph: Robert Brandhuber)

M2 Materials provided for the experiment

- loose loamy soil
- two graduated funnels
- device for pressing
- two filter bags
- two glass beakers
- weighing scales, stopwatch, spoon, graduated beaker
- water

M3 Sections of two soil samples

The dark patches show soil pores or interstices – spaces between the soil particles that are filled with air or water. Soil pores can vary considerably in size, from less than 0.1 micrometres to a diameter of several millimetres. For comparison: an ant is ca. 3–4 mm long.

(Source: StMUGV [2006]: Lernort Boden. Munich, p. 261)

Aufgaben

1. a) Describe the condition of the soil shown in the diagram (M1).
   b) Present well-grounded assumptions (hypotheses) explaining why the soil is in this condition.

2. Using the materials (M2), plan an experiment by means of which you can find out if the reasons you presented for the condition of the soil are correct.
   a) Make a rough sketch of the experimental set-up.
   b) Match the materials used in the experiment to the corresponding elements in reality:
   The water in the experiment corresponds to ……..... in reality. The device for pressing in the experiment corresponds to …….. in reality.
   c) Make notes of your assumptions (hypotheses) of the results of the experiment, using sentences such as “the higher the … the greater the …”

3. a) Carry out the experiment, make notes of the steps you take and present the results of your measurements in an appropriate way.
   b) Compare the findings with your assumptions (hypotheses).

4. Write down assumptions (hypotheses) as to how the experiment would work with a very sandy soil and a clayey soil.

5. With the help of M3, explain the effects that compressed soil, so-called consolidated soil, has on air and water budgets as well as on plants and animals in the soil.

6. Find out if ploughing is a suitable measure to combat soil consolidation. Use the internet (http://eusoils.jrc.ec.europa.eu/library/themes/compaction, retrieved 20.06.2012).

Model answers

			Standards					
No.	Model answer	PL	K	SO	**M**	C	E	A
1	a) It is evident that water is standing in tyre marks and the soil is waterlogged on the surface. b) Possible reasons: Compaction of the soil pores resulting in consolidation of the soil due to the use of tractors. Some of the rainfall can no longer seep through the consolidated soil.	I III	4 19		**4** **6** **9**			
2	a) Sketch in accordance with following description An experiment is planned whereby two comparable soil samples with the same initial weight are placed in two funnels. One sample is placed loosely in the funnel, the other is compacted in the funnel under high pressure. Then the same amount of water is poured over each sample and the through flow speed measured (e. g. the amount of water that has flowed through after 1 minute, 5 minutes, 10 minutes etc. is measured). b) Water: Rainfall/precipitation Device for pressing: tractor c) Assumptions: The more the soil is compressed in the funnel, the longer it takes for the water to trickle through. The more the soil is compacted, the greater the amount of water that remains on the surface. The less the soil is compacted, the better water can percolate etc.	II II III	 18		**5** **10** **11** **9**			
3	a) The experiment is carried out (see above) and recorded in writing. Each individual operation and the findings should be noted (in a table). b) The hypotheses are confirmed or differentiated (see above) and applied to conditions in real life.	I II			**10** **10**			

Continuation →

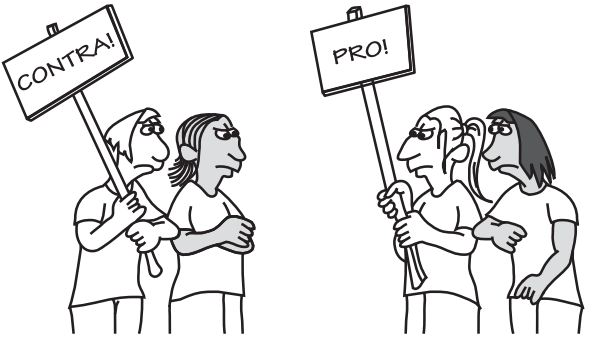
No.	Model answer	PL	Standards K	SO	**M**	C	E	A
4	More water flows through sandy soil than through clayey soil in the same period of time. More water remains on the surface of clayey soil. Clayey soil has smaller particles and more fine soil pores than sandy soil. Fine soil pores are not altered by consolidation. However, the volume of macropores and mesopores in soils is reduced by pressing. Thus consolidated soils are less permeable to water.	III	4		**7**			
5	The sketch on the left shows consolidated soil, the drawing on the right non-consolidated soil. Soil consolidation leads to a decrease in the volume of macro- and mesopores. Thus soil consolidation decreases water permeability. It is more difficult for the roots of plants to penetrate consolidated soil. Water accumulates for longer in consolidated soil, and thus the lack of soil ventilation inhibits root growth. Living conditions for many soil animals also deteriorate because of consolidation.	II	6 18 19		**4** **6**			
6	No. Ploughing cannot restore the original soil condition. It does lead to a rough loosening of the upper soil layer and the development of new macropores there. Mesopores that store water that can be used by plants are not restored by ploughing. The consolidated area beneath the ploughed upper soil layer, the plough sole, remains in place. The use of heavy machines also leads to renewed consolidation in the tyre tracks on the surface. Alternatives are mulching and grubbing, for example.	III	18 19		**4** **6** **7**		2 3	

PL = Performance level / K, SO, M, C, E, A = competence areas
The competence areas and standards focused on in the assignment are printed in bold type.

11 Should we boycott tropical timber?
Role-playing

Situation/problem:

“Since the 1960s an average of two million hectares of rainforest per annum has been burned and felled in the Amazon basin [...], by now 65 million hectares of tropical forest, about the area of France, have disappeared” (Die Zeit, 06.06.2007). Because of the ongoing destruction of the tropical rainforests, a boycott of tropical timber is being discussed in Germany. Is such a boycott worthwhile?



Drawing: C. Pietsch, 2012

M1 Boycotting tropical timber – pro and contra

Supporter

“The timber industry is chiefly responsible for the destruction of the tropical rainforests. For this reason, I call for a total boycott of tropical timber. Interference in the complex ecosystem of the tropical rainforest has unforeseeable consequences that threaten the survival of several indigenous peoples and about 30 million mostly unstudied species of animals and plants. Also, the rainforests as suppliers of oxygen determine our climate. Continued deforestation in the tropics also makes little sense from an economic point of view. The rainforest cannot regenerate, so that there will be increasingly smaller harvests for the timber companies. Most tropical timber is only used in the industrialised countries because it is considerably cheaper than timber from Europe. The trees do not have to be planted and labour costs are low. With the exception of only a few specialised uses, tropical timber can be replaced by native timber. The FSC (Forest Stewardship Council) environmental certificate, introduced by environmental organizations in cooperation with timber companies, is not a solution in my opinion. Firstly, so far it has only been possible to harvest tropical timber in an environmentally and socially acceptable way in very small areas. Secondly the guidelines are so vague that they leave room for very generous interpretation. And it is very difficult to monitor even these very basic minimum requirements. With the exception of a few showcase projects, destructive exploitation continues in the tropical forest. Thus the only effective way of protecting the tropical rainforest is a complete boycott of tropical timber.”

Opponent

“Most tropical countries are faced with the problem of providing a dignified life for starving people. Anyone calling for a boycott of tropical timber should bear in mind that he is depriving these countries of one of their most important sources of income. Also, unutilised forest has practically no new growth. It is in a state of unproductive equilibrium. A forest should be used in such a way that it renews itself without any lasting damage. The emphasis should be on husbandry with a view to the future.

The industrialised countries have the knowledge and the financial means to initiate sustainable forestry in cooperative projects with locals. However, a boycott would make sustainable use impossible. Instead, the timber harvested by exploitative means would continue to be exported into countries that have no interest in environmentally and socially responsible harvesting. Thus a boycott cannot prevent destructive exploitation, instead it encourages it! The aim should be to establish environmentally sound and socially responsible timber harvesting in tropical countries that benefits both nature and local people. For this reason environmental organizations together with the timber industry have developed the FSC (Forest Stewardship Council) certificate awarded when minimum standards are adhered to. With the help of this certificate the consumer can distinguish between sustainably harvested tropical timber and timber from uncontrolled felling (e.g. also from European forests).”

(Source: adapted from TERRA Erdkunde 7/8 für Gymnasien in Nordrhein-Westfalen. Gotha/Stuttgart 2006, p. 85)

Exercises

1. Make a quick survey of opinion in your class by organising a spontaneous vote for or against a boycott of tropical timber. Note the result.

2. Discuss the effects that a boycott of tropical timber could have through role-playing – from the point of view of a Native American, a Brazilian woodcutter, a US timber company, a German garden owner. Each group chooses one of these roles.
   a) In preparation for the role-playing assemble arguments for “your” representative independently and with the help of M1.
   b) Now debate the pros and cons of a boycott of tropical timbers through the role-play.

3. After you have completed the role-play, carry out another survey of opinions in your class. Give reasons for your opinions. Compare the results of the two surveys.

Model answers

No.	Model answer	PL	Standards K	SO	M	**C**	E	A
1	The students vote in accordance with their “gut feeling” and without detailed information.	I						5
2	a) The students look into the situation and position of their representative, using the texts in M1, and note their arguments, e. g. on index cards. b) Role-playing: The representatives of the positions and groups debate.	II III	18 20 18 20		4 6	**2** **5** **6**	2	5
3	The representatives vote after they have looked into the arguments in more detail and from different points of view. They give reasons for their opinions and discuss the results of the two surveys.	III				**6**	2	

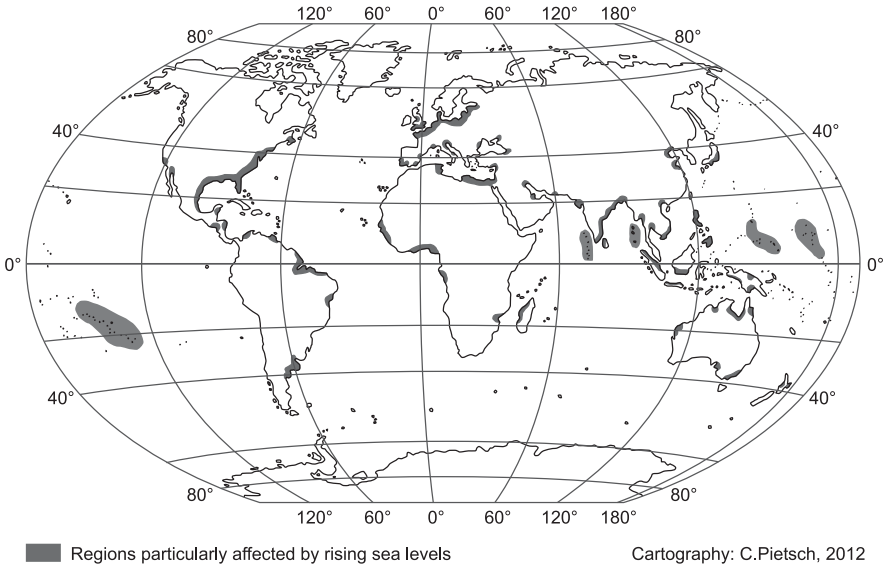
PL = Performance level / K, SO, M, C, E, A = competence areas
The competence areas and standards focused on in the assignment are printed in bold type.

12 Global climate change – The effects of rising sea-levels

Situation/problem:

In 2007, a new report of the international research group “Intergovernmental Panel on Climate Change” (IPCC) on the extent and consequences of global climate change was published. According to this report, sea levels have risen by an average of ca. 20cm over the last 100 years. The scientists believe that, depending on the scenario, a rise in sea levels of 20 to 60cm by 2100 is likely. The main reasons for the current rise in sea levels are the expansion of water through warming, the melting of continental glaciers, and increasingly the melting of Greenland’s ice cap (see IPCC 2007, p. 7, 13). If Greenland’s entire ice crust should melt in the distant future, a rise in sea levels of as much as 7 metres can be expected. What effects does the rise in sea levels have in different parts of the Earth? Is there any protection against them?

M1 Regions threatened by rising sea levels



(Sources: Kelletat, D.: Physische Geographie der Küsten und Meere. 2nd edition. Teubner Studienbücher. Stuttgart, Leipzig 1999, p. 200. Brückner, H., Radtke, U. & H. Sterr: Trifft es nur die Armen? Der Meeresspiegelanstieg und seine Folgen für die Küstentiefländer der Erde. In: Ehlers, E. & H. Leser (Eds.): Geographie heute – für die Welt von morgen. Gotha 2002, Karte und Tabelleninfo: p. 93)

M2 The effects of rising sea levels

The following main effects are associated with an accelerated rise in sea levels:

- Permanent flooding of low-lying coastal areas (marshes, large river deltas, mangroves etc.) and islands
- Increased frequency of storm tides
- Increased erosion along low-lying and steep coasts
- Increasing salinity of groundwater and soils in coastal areas
- Problems with the drainage of agricultural areas at sea level

(Source: adapted from Brückner et al. 2002, p. 93)

M3 International comparison of vulnerability given a 1m rise in sea levels

	Germany	Netherlands	Marshall Islands
area affected	3.5 %	70 %	80 %
population affected	2.8 %	67 %	100 %

(Source: Behnen, T.: Der beschleunigte Meeresspiegelanstieg und seine sozio-ökonomischen Folgen. Hannoversche Geographische Arbeiten. Vol. 54, Münster/Hamburg 2000, p. 181)

M4 Problem and strategies: The example of Sylt

Strategy A

With the help of well-directed measures, it is possible to continue to use endangered coastal area in spite of a rise in sea levels. For example, the loss of certain areas to the sea (coastal erosion) can be accepted while other areas are protected. Also conceivable is restructuring, replacing agriculture with an emphasis on fisheries (e. g. breeding fish, shellfish farming).

Strategy B

Here the endangered coastal areas are abandoned. No measures are adopted to counter declining productivity due to rising sea levels. Construction and development plans are abandoned. The population packs up and moves to higher-lying areas. Property and infrastructure are left to the rising sea.

Strategy C

In this strategy the protection of people and resources in endangered areas has top priority. The strategy calls for the long-term, anticipatory planning of protective structures and involves high costs for construction measures, maintenance and the raising of structures when necessary. Protective measures include fixed constructions such as dykes, flood walls, river dams or tidal control gates. So-called “soft” measures such as filling up beaches with extra sand or the creation, preservation and maintenance of sand dunes may also provide the necessary protection. However, soft measures only have short-term effects and have to be renewed regularly.

(Sources: adapted from Kanwischer, D. & A. Kohly: Land unter in Schleswig-Holstein? Eine Unterrichtsanregung zu Klimawandel und Meeresspiegelanstieg. In: Geographie heute, H. 241/242, p. 16–24)

Exercises

1. a) Name parts of the Earth that are particularly affected by rising sea levels (M1, atlas) and find at least one example for each of the endangered areas listed in M2 (marshes, deltas, mangroves, islands).
   b) Locate the regions named in Table M3 (Germany, the Netherlands and the Marshall Islands) and mark them on the map M1 (atlas).

2. Compare the effects of rising sea levels for these three regions (M2, M3).

3. In Germany, for example, the island of Sylt is among the endangered areas. Three strategies (retreat, adaptation, protection) that could be adopted by the inhabitants in reaction to rising sea levels were discussed (M4, atlas).
   a) Match each of the texts A, B and C to the three strategies.
   b) Evaluate the three strategies from the viewpoint of an environmental protectionist, an islander and from the perspective of the Minister of Finance of Schleswig-Holstein (the federal state to which Sylt belongs). To do this, create a table with nine cells and enter + and – symbols.
   c) Consider whether all of the islanders would adopt the same strategy.
   d) Imagine you have the political responsibility for planning on Sylt. Choose a strategy and give reasons for your decision.

4. Discuss the three strategies from the point of view of the inhabitants of the Marshall Islands and assess what scope for action they have.

Model answers

No.	Model answer	PL	K	Standards SO	M	C	E	
1	a) *America:* e. g. Florida, Gulf of Mexico, the mouth of the Rio de la Plata / *Europe:* e. g. Normandy, North Sea and Baltic coasts / *Africa:* e. g. coast of Gambia, Niger delta, coast of Gabun, the mouth of the Limpopo, Nile delta /*Asia:* e. g. mouth of the Indus, southern New Guinea / *Australia:* e. g. Gulf of Carpentaria *Marshes:* e. g. North Sea coast, Canada *Mangroves:* e. g. Australia, mouth of the Amazon *Deltas:* e. g. Ganges delta, Rhine delta *Islands:* e. g. Tuamotu Archipelago, Micronesia b) Correct marks on map M1	I		1 3 4 1	4 6	1 2		
2	All three regions are affected. Germany is least affected, the Marshall Islands are most affected, as all of the Islands’ inhabitants can expect to be faced with flooding, erosion and salinization. In Germany only the coastal areas are affected. In the Netherlands two thirds of the inhabitants are affected, because they live close to the coast and large parts of the country lie below sea level.	II	17		4 6 7	1 2		

Continuation →

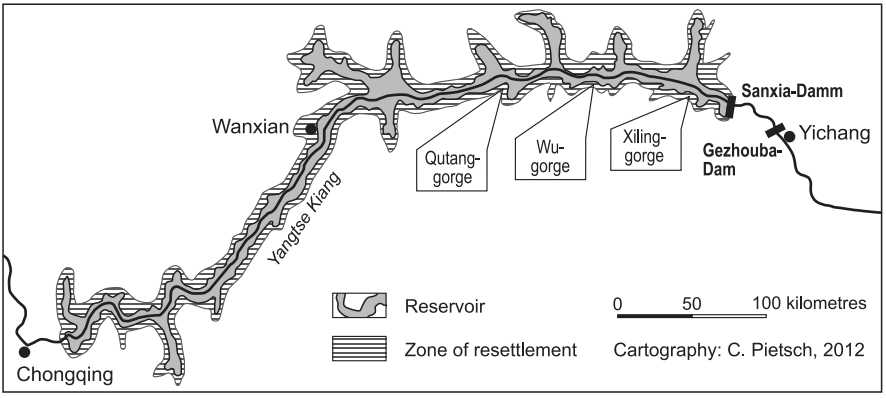
			Standards					
No.	Model answer	PL	K	SO	M	C	**E**	
3	a) Strategy A means adaptation, B retreat, C protection. b) Create a cross-classified table with the axes Perspective/Environmental protectionists/Island inhabitants/Minister of Finance on the one side, Strategy A/B/C on the other. Enter evaluations with “+” and “-”. c) Their interests vary, therefore an islander with a house directly by sea would be in favour of protection, a fisherman would argue for adaptation and an environmental protectionist for retreat or adaptation. d) Total protection would involve setting the coast in concrete and constructing dykes and would be neither affordable nor attractive for residents and tourism. If I had political responsibility, I would … (numerous suggestions are possible here).	II/III	20		4	1 2 2	 **1** **2** **1** **2** **1** **2**	2 5 11 8
4	The inhabitants of the Marshall Islands could choose strategy B and possibly A for a short time only. Strategy C is neither affordable nor realistic. Ultimately they have very little option other than to wait and see while preparing a complete retreat. They could apply for environmental asylum now, set up a warning system, lobby for climate protection in international organizations.	III				6	**1** **2** **6**	11

PL = Performance level / K, SO, M, C, E, A = competence areas
The competence areas and standards focused on in the assignment are printed in bold type.

13 The Three Gorges Dam in China – (not) a contribution to sustainable development

Situation/problem:
The Three Gorges Dam was inaugurated in 2003. The Chinese government celebrated it as a major technical achievement which would help to solve several fundamental problems, e. g. the provision of electricity for a rapidly growing population and protection from flooding. However, critics of the dam emphasise those consequences of the dam which can be described as disastrous. Can the world’s largest hydroelectric project make a contribution to sustainable development in China?

M1 The world’s largest hydroelectric project



M2 Evaluation matrix

Nature (plants, animals) (+) --- (–)	Air; climate (+) --- (–)	Soils (+) --- (–)
Population (+) --- (–)	Economy (+) --- (–)	Water (+) --- (–)
Behaviour; emotions (+) --- (–)	Politics; society (+) --- (–)	Technology; science (+) --- (–)

(Source: adapted from Lüder, H. J.: Staudammprojekte weltweit – Fallbeispiele nicht nachhaltiger Entwicklung. In: Clasen, G. et al.: Unterricht zu den Syndromen des globalen Wandels. Werkstattmaterialien des BLK-Programms „21“ Nr. 24, Berlin 2003, p. 71)

M3 The Three Gorges Dam in the headlines

1 **Environmentally sound energy production** China’s economic growth can only continue as rapidly as before if enough energy is available; the hydroelectric plant on the Yangtze Kiang takes the place of air-polluting coal-fired power stations that would accelerate the greenhouse effect and consume 40 million tonnes of coal per annum.	8 **Flood protection and flood control** Catastrophic floods occurred in 1931, 1935, 1954, 1995 and 1998, and ca. 70,000 people have died since 1870.
2 **Earthquake risk** The mass of the reservoir, which is located in a seismically active zone, could trigger eathquakes; a breach in the dam would cost millions of lives.	9 **Political prestige** China has shown the world what it can do; the Three Gorges Dam is an important “prestige project” for China.
3 **Rising water levels** Intended to increase ship transports from ten to 50 million tonnes per annum, also the arid regions in northern China can only be provided with piped drinking water from a dam height of 200 m.	10 **Resettlement of more than 1.3 million people** Loss of historic sites, e. g. 5000-year-old tombs.
4 **Siltation** Heavy deforestation along the upper course of the Yangtze Kiang responsible for flooding; riverborne (eroded) material causes siltation of the reservoir.	11 **Government geological report** The dam can withstand quakes up to 7.0 on the Richter scale.
5 **Generous compensation payments** The government promises modern settlement areas and new jobs in agriculture and industry. Fertile land compensated with land five times the area of the land lost.	12 **Financing the project** The project is financed e. g. by increased prices for electricity, as it was almost impossible to find foreign investors for this hazardous project costing ca. 38 billion US$. China cannot afford the project.
6 **Susceptibility to military blackmail** Threats of destruction by enemies are possible.	13 **The question of cost** The dam costs less than the regulation of flood damage and the construction of new coal-fired and nuclear power stations.
7 **Energy production can be seriously restricted** Increased erosion causes increased siltation in the reservoir basin, Chongqing harbour could be blocked by increased sedimentary load.	14 **Flooding of fertile Yangtze valley floor** China has relatively few fertile regions.

(Source: adapted from: Pro und Contra Drei-Schluchten-Damm in China. Klett Arbeitsblatt, Leipzig 2006; www.klett.de/sixcms/media.php/177/ab_drei_schluchten.doc)

Exercises

1. Using M1 and your atlas, describe the location of the new reservoir on the Yangtze Kiang, Asia’s longest river. Compare the length of the reservoir with that of the Rhine (1320 km).

2. Almost no man-made construction has ever been as controversial as the Three Gorges Dam. This controversy is reflected in the newspaper extracts in M3. Try to develop your own opinion. With the help of M2, create a matrix by matching the 14 newspaper headlines to the corresponding sections.
   Differentiate between expected postive (+) and negative (-) effects. Some headlines may fit into several categories.

3. “Sustainable development” is a value measure. It takes into account the aspects ecology, economics and social concerns. Sustainable development involves reconciling the preservation of natural resources (ecology) with economic development (economics) and social security (social concerns). In this way future generations should also be able to use nature as a resource.
   Use your matrix to examine whether the Three Gorges Dam is a project corresponding to the value measure of “sustainable development”.

Model answers

		Standards						
No.	Model answer	PL	K	SO	M	C	**E**	A
1	Location: ca. 111°E and 31°N; The dam is located at the point where the Yangtze Kiang leaves the Daba Shan Mountains, entering the Tangho Basin in central East China; in the middle course of the river west of the city of Yichang in Sandouping to near the city of Chongquing; Length: - ca. 660 km; the reservoir is about half as long as the river Rhine.	I/II		1 2 3 4	2 4			

Continuation →

No.	Model answer	PL	Standards K	SO	M	C	**E**	A
2	Possible matrix: It would make sense to enter all of the arguments into the matrix. Nature (plants, animals) (+) 1, 8 / (–) 4 Air; climate (+) 1 / (–) Soils (+) / (–) 2, 7, 14 Population (+) 3, 5, 8 / (–) 2, 4, 8, 10 Economy (+) 1, 3, 5, 13 / (–) 3, 4, 7, 10, 12 Water (+) 3,8 / (–) 4 Behaviour; emotions (+) 9 / (–) 2 Politics; society (+) 5 / (–) 6, 12 Technology; science (+) 8, 11 / (–) 10	II/III	17		4 7 8	4	**1** **2**	
3	The students examine the project in the light of the value measure “sustainable development”. When examining and evaluating the headlines it is important to consider all three aspects of sustainable development. CO_2-neutral energy production is compatible with sustainable development, as are the project’s contribution to economic and national development and the maintenance and improvement of living standards for a rapidly growing population. However, in the course of these developments natural resources are affected. Prejudicial to sustainable development are e. g. the loss of land, increases in electricity prices and the risk of siltation. It is also important to differentiate between the more short-term effects and the desired long-term effects. The answer to the question whether the project corresponds to the value measure of sustainable development remains open, and depends on how individual aspects are weighted. Students can arrive at different reasoned personal positions.	III	17 18 19		4 7 8		**7** **8**	2 6 7

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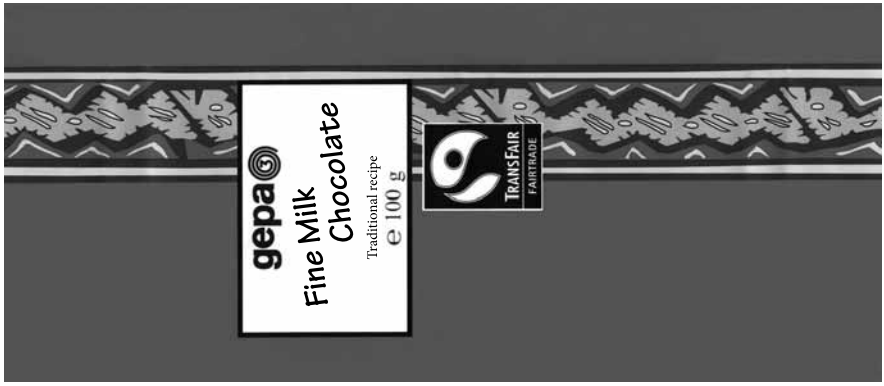
14 The significance of fair trade – the example of chocolate

Situation/problem:
After school, Julia and Mark stroll through the market on their way to the bus stop. Mark fancies a bar of chocolate. On one stall they find several bars with a TransFair logo. When Mark asks what they cost he is surprised. One bar costs €1.10, which is a good bit more than a “normal” supermarket bar of chocolate for around 75 cents. Why is the chocolate more expensive?

M1 Fair trade chocolate



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4 013320 032503
Code: 8 9 1 1 8 0 6

e 100 g

Fine Milk Chocolate
Ingredients:
Cane sugar°, cocoa butter°, whole milk powder, skimmed milk powder, cocoa mass°, cream powder, hazelnut paste 1%, vanilla, cocoa 32% minimum, dairy ingredients 26%. May contain traces of wheat.

° Fair trade products, from our trading partners Kuapa Kokoo/Ghana, El Ceibo/Bolivia, MCCH/Ecuador

Nutrition (averages / 100g):
Energy value: 2362 kJ/565.2 kcal
Protein: 7.9g,
Carbohydrates: 49g
Fat: 37.5g

GEPA (Society for Partnership with the Third World) is Europe's largest fair trade company and has decades of experience in socially and ecologically responsible trade with producers from the Third World.

The TransFair logo on this product is a guarantee of independently monitored fair trade criteria.

Contains only cocoa butter; free of other fats, without added soya lecithin
Store in a cool, dry place

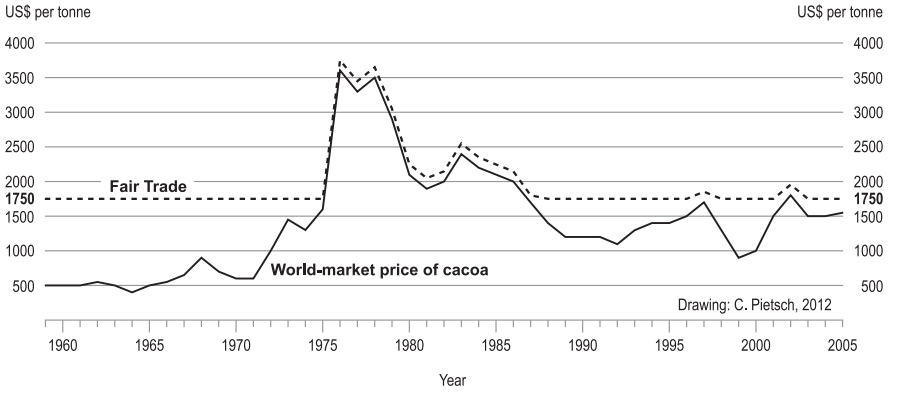
Sales and information:
gepa Fair Trade Handelshaus, Postfach 260147, 42243 Wuppertal, www.gepa3.de

07.2007
L1262B3

(Please note: the information on the chocholate wrapper may vary, e.g. countries of origin)

(Please note: the information on the chocolate wrapper may vary, e. g. countries of origin)

M2 The price of cocoa in US$ per tonne



Cocoa farmers are paid a mimimum price of US$ 1750/tonne for cocoa beans by the Fair Trade cooperatives. If the world-market price exceeds US$ 1600 they are automatically paid US$ 50 more than the current world-market price. Price fluctuations are due to factors such as variations in harvests (e. g. because of weather conditions, pests) and make it difficult for farmers in developing countries to predict their income. The buyers in the industrialised countries (e. g. chocolate factories) have buffer stocks of cocoa beans and are therefore less dependent on price fluctuations; thus prices for cocoa and chocolate remain stable here.

(Sources: adapted from: www.kakaoverein.de, www.fairtrade.net/fi leadmin/user_upload/content/Cocoa_SF_Dec_05_EN.pdf; retrieved: 20.06.2012)

M3 The life of a cocoa farmer’s family in Bolivia

The cocoa cooperative El Ceibo is located 270 km north of La Paz in the Bolivian Amazon region. It was founded in 1977 by farmers’ village cooperatives, and aims to monitor the production, processing and marketing of cocoa as well as to improve the farmers’ living conditions. With the help of income from fair trade, a plant was built for processing cocoa beans and producing chocolate for the domestic market. There is also a broad range of agricultural training programmes. Today, El Ceibo secures a livelihood for more than 5,600 people. Around 800 families are members of the association. One of these is the Gutierrez family. The daughter tells her story:

I, Susy Gutierrez, am 16 years old and live in the little village of Sapecho on the river Beni. We are a cocoa farming family. Before we joined El Ceibo, neither I nor my eight siblings could attend school. Even as little children we had to work hard to help our family to survive, because our father didn’t earn enough money seeling cocoa. At harvest time, a little money trickled into our house every two to three weeks. We lived on rice, eggs, our hens and the fruit we found in the forest. Our little hut had only two small rooms for eleven people and a tiny cooking place. There was no piped water and no electricity.

Ceibo guarantees to buy cocoa from us farmers, for a price that is considerably higher than the world-market price for cocoa. We have been living in a new house for some years now. Thanks

to their membership of the cooperative my parents were able to repay the loan for this house faster. The long-term supply agreement with El Ceibo for the cocoa beans gives our family security. The harvest is financed in advance. My siblings and I can go to school now. I will have my school certificate soon. It is my dream to do an Open University degree in forestry with the support of El Ceibo and later on to manage my own successful cocoa plantation.

(Source: adapted from www.checked4u.de/doc113087A.html; retrieved 20.06.2012)

Exercises

1. a) Use M1 to name the countries that supply the chocolate shown here and give their rough location (latitude and longitude).
   b) Compare the three countries with other countries that produce cocoa, and tick off their common features (atlas!)
   ( ) They are located in the subtropics.
   ( ) They are developing countries.
   ( ) They are in the tropics.
   ( ) They are industrialised countries.

2. Use M1 and M2 to explain the higher price you have to pay for fair trade chocolate.

3. Imagine you are interviewing Susy Gutierrez for your school magazine in order to inform your readers about fair trade and Susy’s family’s life before and after the foundation of the El Ceibo cooperative (M3). Plan your questions and Susy’s possible answers with a partner.

4. The market stall also has chocolate bars with an eco logo as well as the TransFair logo.
   Which statements apply to the TransFair logo and which to the eco logo:
   a) The ingredients are produced organically.
   b) Partnerships with developing countries are supported.
   c) Social and ecological measures in the areas of cultivation are supported.
   d) The cocoa farmers don’t use artificial fertilisers or pesticides.

5. a) Together with your classmates, think about ways of supporting the sale of fair trade chocolate at your next school event. Use information from the internet (e.g. www.fairtrade.net).
   b) Design a poster for your fair trade stall.

Model answers

			Standards					
No.	Model answer	PL	K	SO	M	C	E	**A**
1	a) Ghana, Bolivia, Ecuador. The areas where cocoa is cultivated are all close to the equator. b) Common factors: tropics, developing countries	I II		2 4 4	4 6	1 2		
2	The world-market price for cocoa beans fluctuates considerably. However, the fair trade cooperatives always pay the farmers more than the world-market price. Because the higher prices for fairly traded cocoa have to be financed by the consumer, fair trade products cost most than products whose price is determined by the world-market price.	II	13 15		4 6	1 2		
3	Possible questions for Susy: - What does fair trade mean? - When was El Ceibo founded? - What was your life like before the foundation of El Ceibo? - What is your life like today? Possible answers: - Life today … - New house - Loan repaid more quickly - Security - Harvest financed in advance - Children can attend school - Susy can do a university course	II	11 12 13		4 6 8	2 4		**5**
4	Transfair logo: b, c / Eco logo: a, d	II						**1**
5	a) Options: Stall selling chocolate, raffle, film chocolate quiz … b) Poster design	III III			2 4 8	 4		**5** **7** **9**

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