Volume 1-2018
ISSN 2191-3900

geo LOGE

... die geographische Open-Access-Zeitschrift

Editorial

Liebe Leserinnen und Leser

Genau jetzt, in diesem Moment, während Sie diesen Satz lesen, werden mehrere Hektar Wald gerodet und tausende Liter Mineralwasser abgefüllt. Unser Planet versorgt uns permanent mit Rohstoffen, die wir für unser tägliches Leben benötigen. Manche dieser Rohstoffe sind über Jahrmillionen entstanden, während andere nur Monate brauchen, um zu wachsen.
Die meisten von Ihnen werden mit dem Thema zunächst Explorationen, Erschließung aber auch den Abbau verbinden. In dieser Ausgabe soll es jedoch vermehrt um die anschließenden Schritte gehen, nämlich der Verbreitung der Rohstoffe und der damit verbundenen Nachfrage, wie es im Artikel „Models for Community Supported Agriculture - Comparing Shanghai with Germany“ beschrieben wird. Zudem wird behandelt, wie nach Erschöpfung der Vorkommen, die Stilllegung und Aufbereitung von Flächen, auf denen Rohstoffe abgebaut wurden, geschieht. Der Leitartikel dieser Ausgabe beschäftigt sich daher mit dem Thema „New challenges and opportunities: Decommissioning of Offshore Oil and Gas structures“. Neben den Artikeln zu den Themen sowie aktuelle Einblicke in die Lehre, warten natürlich auch wie gewohnt Rezensionen über interessante Fachbücher darauf, gelesen zu werden.

Wir wünschen eine spannende Lektüre,

Ihre geo Loge Redaktion

Das Redaktionsteam v. l. n. r.: Bianca, René, Lena, Patrick, Mike

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Andreas Rienow

Geographisches Institut nun Mitglied im “Copernicus Academy Network“

Aus der Lehre

Die Arbeitsgruppe Geomatik des Geographischen Instituts hat sich erfolgreich für die Mitgliedschaft im “Copernicus Academy Network“ beworben. Die Europäische Kommission etabliert mit der Copernicus Academy ein Netzwerk von Bildungs- und Forschungseinrichtungen, die Copernicus-relevante Aus- und Weiterbildungsaktivitäten durchführen. Durch Satelliten- und In-situ-Beobachtungen liefern die Dienste nahezu Echtzeit-Daten auf globaler Ebene, die ebenso für lokale und regionale Bedürfnisse genutzt werden können.

Copernicus ist das gemeinsame Erdbeobachtungsprogramm der Europäischen Union und der Europäischen Weltraumorganisation ESA. Das Ziel von Copernicus, zuvor GMES (Global Monitoring for Environment and Security) genannt, ist es Politik, Wirtschaft und Wissenschaft dauerhaft mit verlässlichen und aktuellen Informationen auf Basis von Erdbeobachtungsdaten zu versorgen. Dazu werden im Auftrag von Copernicus insgesamt zwölf Satelliten in die Umlaufbahn der Erde befördert. Diese sind mit verschiedenen Kameras ausgestattet, welche Daten in den sechs Bereichen Atmosphere Monitoring, Marine Monitoring, Land Monitoring, Climate Change, Emergency Management und Security bereit stellen.

Die von den Copernicus-Diensten bereitgestellten Informationen können von Endbenutzern für zahlreiche Anwendungen in einer Vielzahl von Bereichen genutzt werden. Dazu gehören Raumplanung, nachhaltige Entwicklung, Naturschutz, Landwirtschaft, Forstwirtschaft, Fischerei, Gesundheit, Katastrophenschutz, Infrastruktur, Verkehr und Mobilität sowie Tourismus.

Als Mitglied des Copernicus Academy Netzwerks profitiert das Geographische Institut vor allem durch Forschungs- und Bildungsprogramme im Zuge der Nutzung des Copernicus Programms. Zudem steht dem Geographischen Institut sowie jedem Studenten im Einzelnen ein wachsendes Angebot an Informationsmaterial zur Verfügung, das im Auftrag der Kommission entwickelt wird. Über einen Account sind die Daten frei zugänglich und kostenlos zu erhalten.

Aktivitäten des Copernicus Academy Network, z.B. die Durchführung von Veranstaltungen oder das Entwickeln von Weiterbildungs-Curricula, können auch finanziell unterstützt werden. Ein Ziel ist es, zunächst in Schulen das Angebot und die Qualität der Unterrichtsmaterialien in Hinblick auf die Fernerkundung, beziehungsweise Geographie, deutlich zu verbessern. Langfristig soll ebenso die universitäre Lehre anspruchsvoller gestaltet werden.

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Meike Driessen

Wie Weltraumbilder in den Schulunterricht kommen

Aus der Lehre

Bilder der Erde aus dem Weltall üben eine große Faszination aus. Geografen der Ruhr-Universität Bochum (RUB) und der Universität Bonn helfen Schülerinnen und Schülern zu entdecken, wie viel mehr dahintersteckt. Im neuen Projekt Kepler ISS entwickeln sie unter anderem Smartphone-Apps, die Übungsblätter beleben, und einen Schulwettbewerb in Zusammenarbeit mit dem Deutschen Zentrum für Luft- und Raumfahrt (DLR). Das Projekt startet im Mai 2017 und wird von der Raumfahrtagentur des DLR mit Mitteln des Bundesministeriums für Wirtschaft und Energie für zwei Jahre mit rund 400.000 Euro gefördert.

Die Internationale Raumstation (ISS), die die Erde ungefähr alle anderthalb Stunden umrundet, ist mit vier Kameras ausgestattet, die Tag und Nacht hochaufgelöste Live-Bilder zur Erde schicken. Diese Bilder der NASA-Mission High Definition Earth Viewing (HDEV) sind nicht nur schön, sondern enthalten auch viele Informationen. „Man kann zum Beispiel erkennen, wie die Landnutzung durch den Menschen mit dem Klimawandel in Zusammenhang steht – wenn man die Bilder richtig lesen kann“, erklärt Prof. Dr. Carsten Jürgens vom Lehrstuhl Geo-Fernerkundung der Arbeitsgruppe Geomatik der RUB.

Bilder und Informationen für Schulen aufbereiten

Dazu bereiten die Wissenschaftlerinnen und Wissenschaftler im Projekt „Kompetenzorientiertes, erfahrungsbasiertes und praktisches Lernen mit Erdbeobachtung von der ISS“, kurz Kepler ISS, die Bilder und Informationen so auf, dass sie für den Schulunterricht nutzbar sind. „Wir orientieren uns dabei immer an den vorgegebenen Lehrplänen der Sekundarstufen I und II für die MINT-Fächer, Mathe, Informatik, Naturwissenschaft und Technik“, sagt Projektmitarbeiter Dr. Andreas Rienow. Die Materialien stellen die Forscher auf verschiedenen Online-Plattformen für Lehrerinnen und Lehrer zur Verfügung. Außerdem bieten sie Workshops für Lehrpersonal von Schulen an. „Unser Ziel ist, dass die Schülerinnen und Schüler eigenständig lernen und das Lehrpersonal eher eine Moderatorenfunktion einnimmt“, erläutert der Geograf. Dabei eignen sich die Materialien nicht nur für den Erdkundeunterricht, sondern auch für andere Fächer, zum Beispiel Physik.

Abb. 1: Mit dem Smartphone und der App über das Arbeitsblatt schwenken und gleich einen passenden Film starten: Das ist Augmented Reality. (©RUB, Marquard)

Wettbewerb fordert Kreativität

Mittels Augmented Reality gewinnen zum Beispiel die Lehrinhalte an Leben: Nach der Installation einer App sollen Schülerinnen und Schüler mit dem Smartphone über ein Arbeitsblatt schwenken und etwa ein Video abspielen können, das vertiefte Informationen

zum Dargestellten zeigt. Im Projekt geplant ist außerdem ein Schulwettbewerb, der den Raumflug des deutschen Astronauten Alexander Gerst begleiten soll. „Da wird Kreativität gefragt sein, und die Gewinner werden ganz besondere Trophäen bekommen“, verspricht Andreas Rienow. Das Projekt soll Schülerinnen und Schülern für die Fernerkundung aus dem All begeistern und somit auch möglichen Nachwuchs für die Wissenschaft.

Das Projekt Kepler ISS ist der Nachfolger des Projekts Columbus Eye, das an der Universität Bonn beheimatet war, und baut auf dessen Erkenntnissen auf. Auf der Projektwebseite können zum Beispiel Livebilder der ISS-Kameras angeschauet oder gezielt nach Aufnahmen von Naturereignissen wie Taifunen oder Vulkanausbrüchen gesucht werden. Die Bochumer und Bonner Forscher sind die einzigen, die die von den Videokameras erzeugten Bilder archivieren. Die NASA hatte sie anfangs für nicht archivierungswürdig befunden, nun aber Interesse an dem Archivmaterial angemeldet.

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Mirka Erler & Götz Loos

Adapting Community Supported Agriculture – Comparing Shanghai with Germany

Artikel

Abstract: The concept of Community Supported Agriculture (CSA) is gaining popularity around the world. Providing a direct marketing channel between consumers and producers of food it could be the solution for demanders of organic food in countries where the supply is difficult. Beyond food supply CSA can provide benefits such as recreation and decreased food waste. To assess what demands consumers in Shanghai would have towards a CSA a survey (n=53) was implemented. Desk research as well as expert interviews with suitable CSAs were carried out to find out if there are suitable CSA models for Shanghai in Germany. A comparison of the findings showed that the CSA concept is applicable if adaptions are made. Challenges for a CSA in Shanghai include the difficult transport situation. Furthermore, CSA members in Shanghai are likely to have a high service demand towards a CSA farm.

Keywords: CSA, Shanghai, China, Germany, Alterative Food Networks, Organic Food, Food Security, Solawi, Consumer Expectations

Introduction

Food safety is a dire and constant issue in China jeopardizing the health of both producers and consumers (Mol 2014: 49–50). Repeated reports about food scandals depict an extremely negative image of the Chinese food system (Xu 2012: 1–4). Although the Chinese government tried to tackle these problems via policies and the establishment of enforcing institutions (Liu et al. 2013: 94; Xu 2012: 1–4) it failed to communicate its efforts effectively and the trust in the public food system remains low (Liu et al. 2013: 99; Scott et al. 2014: 159). To feed the People's Republic large population the government promotes the industrialization of agriculture, instead of smallholder farms. This development is amplified by the avoidance of certain food products after food scandals, which results in economic losses for the producers of the affected pro ducts. Small scale producers are often unable to balance these losses and subsequently must abandon their farms (Xu 2012: 1–4). In Chinese usage 'ecological production' is equivalent to the English 'sustainable production' containing a large scope for interpretation. The term roughly implies the use of less chemicals during production (Shi et al. 2011: 552). Even for ecological production Chinese policies in the last years intend industrialized dimensions (Scott et al. 2014: 159). Most organic products are exported to foreign markets (Qiao 2011: 133), which might be the reason for the perceived lack of labelled and certified organic food in China (Liu et al. 2013: 99; Scott et al. 2014: 159). Furthermore, the high price sensitivity of most Chinese consumers as well as a paucity of product variety and marketing channels prevents the organic sector from higher domestic success (Liu et al. 2013: 98–100). This brief description of the Chinese food system calls for new approaches to ensure food safety and to justify the higher prices of organically produced food, to name only a few. Community Supported Agriculture (CSA) could be such an approach. A CSA project is an alternative food network in which food is produced on a farm and distributed directly to a certain amount of people, supporting the farm with money (Distribution Share) or work force (Working Share) (Brown & Carter 2003; Shi et al. 2011: 553–554; Chen 2013: 38). There are manifold CSA-type pro jects around the world including individual management approaches. According to scho-

larship two methods appear to be the most common ones: While management decisions are made by the farmers in the Subscription CSA, consumers take management decisions collectively in the Shareholder CSA (Shi et al. 2011: 553; Hayden & Buck 2012: 333; Adam 2006: 2).

The increased involvement in the processing of the food achieved by a CSA can replace cost-intensive conventional organic third-party certification by participatory certification (Cooley & Lass 1998: 228; Mol 2014: 52; Scott et al. 2014: 164). Urban agglomerations are more likely to provide a CSA with a relevant market since an urban population is often more susceptible to alternative lifestyles (Lovell et al. 2010: 339). A CSA could provide a city with higher food security, stronger consumer-producer relationships, and decreased transportation routes as well as a compensating area for nearby urban structures (Mol 2014: 52; Adam 2006: 3). To create awareness about local demands a bottom up approach with potential members is advisable when implementing a CSA (Lovell et al. 2010: 332–339; Feagan 2007: 39).

At the beginning of the research in spring 2014, the city of Shanghai in the South-East of China did not have any CSA projects. The overall objective of the study presented in this article was to find out about the preferences of potential Shanghainese CSA members and compare them with experiences of German CSA projects. To do so it is important to know how many resources in form of time and money the people are willing to invest and how the distribution of the CSA shares should best be executed. The comparison was used to determine whether German CSA models match Shanghainese demands or if the concept of CSA needs to be adapted very specifically to the local demands in Shanghai.

Methodology

In total three methods were used to meet the objective of the study: The first method was a quantitative survey. The questionnaire contained questions about demand and preferences for a potential CSA in Shanghai. Participants were sampled from affiliates of the College of Urban Planning and Architecture of Tongji University. Questionnaires were dealt out at one information event for staff members of the college as well as in two architectural offices of former students of the college. This approach was chosen on the grounds of the researcher's own affiliation with the institution. Furthermore, since in most cases the members of a CSA farm have a relatively high income and are well educated (Stöwer 2010: 27), it is likely that the respondents from academia would be attracted by the concept which makes their answers more relevant than a completely random sample among Shanghai's citizens. 53 responses were retrieved. The second method was desk research carried out to find out about the existing types of CSA within Germany in terms of management and organisation. For that the list of existing farms from the German CSA umbrella organization "Netzwerk Solidarische Landwirtschaft" was used. Every farm which had a homepage in October 2015 was included in the review. In total 71 farms were included. The following characteristics were collected: location of the CSA, organization (shareholder or subscription CSA), cooperation (distribution or working share), target area or city of distribution, funding, product variety (only vegetables or also other products such as animal products and cereals), rates (monthly rates or larger prepayments), membership conditions, and frequency of distribution. The third method was expert interviews with five German CSA farmers. The sampling of experts in Germany was done by criteria derived from the quantitative interviews in Shanghai: The CSA should supply inhabitants of a larger city (to ensure the comparability with Shanghai), it should be a Subscription CSA with a Distribution Share, it should not require larger

prepayment, and it should have additional distribution chains over and above the CSA. To be regarded as an expert people had to be in responsible for management decisions and needed to be involved in the foundation process. All management teams of the CSAs that fulfilled these criteria were approached via email and asked if they could take part in an expert interview. All experts who agreed to be interviewed were farmers, founders and managers of their respective CSA project. The aim was to generate three interviews. As the proximity to a large city of two CSAs was misjudged, two more interviews were generated. All five interviews were evaluated for the study. The interviews with the CSA representatives in a more rural environment were discussed regarding their rural setting in terms of food distribution. Tab.1 shows the distribution of the interviewed CSAs in Germany.

Tab. 1: Charactersitic Data of the five CSA Stations in Germany

Expert	Shares	City of distribution	Date of interview
1	120	Dresden	17.12.2015
2	30	Lübnitz (rural)	28.12.2017
3	64	Braunfels (rural)	05.01.2016
4	135	Bremen	12.01.2016
5	400	Hamburg	15.01.2016

Results

The respondents of the quantitative survey were predominantly female and between 20 and 35 years old. The educational level was relatively high with most respondents holding at least a bachelor degree. Single households were rather uncommon among the participants and sharing the household with parents was a common phenomenon. More than half of the respondents (37) were concerned or even very concerned about food security in China. Most respondents (43) declared to buy green or ecological food at least occasionally and almost all respondents (51) would buy more green or ecological food if it was cheaper. Most of the respondents (47) would also like to participate on a farm in somehow or other either by working or by attending events held on the farm. The willingness to participate even increased in the case that it would lower the food prices. The willingness to make a prepayment was rather low among the respondents (see Fig.1).

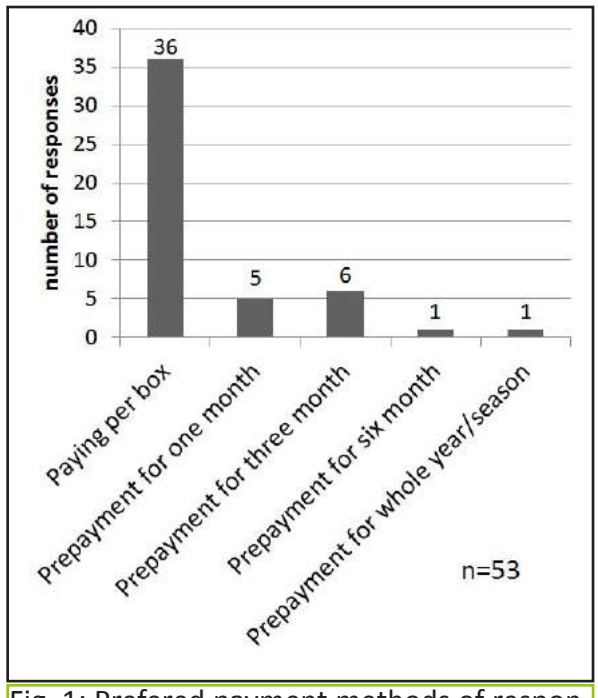

Fig. 1: Prefered payment methods of respondents

Public transport was the favoured way of transportation to reach the distribution point of the CSA-food; other means of transport which could be used to pick up the share were by foot, bicycle or car. The distance that most of the respondents (n=36) would tolerate to the next distribution point was rather less than 1km, which would almost make no difference to a home delivery which most respondents (n=39) would also prefer. Delivery to the working place was not regarded as an alternative. More than half of the respondents (n=28) are interested in participating in the farm work. More than a third would even consider cultivating a small spot by themselves. To participate in a CSA farm, the re-

spondents would pay about 1.300 RMB (175 €) per month. Half of the respondents want to receive their vegetable shares once a week. Another sixteen respondents would prefer to receive their vegetables twice a week. Only a few respondents would prefer to receive their food more often. 11 participants of the study were parents and 8 of them were concerned (n=2) or even very concerned (n=6) with the safety of food.

The research about the 71 German CSA farms led to the following results: The category which was chosen to classify the CSAs was the organisation form. The division into Shareholder and Subscription CSA could not always be done so a third type was categorized as Semi Shareholder CSA. In this organization form a large part of the decisions could be made by the members but they did not have a say in which species would be cultivated. A similar problem was met with the form of cooperation. The categories 'voluntary working share' and 'working share with distribution work' were added corresponding to the existing cooperation forms. Voluntary working shares are those which state that the member's assistance is necessary to keep the farm working but in contrast to the working share, do not obligate their members to help with the farm work. Working shares with distribution work are those which only obligate their members to manage the distribution of the food at distribution points in the city themselves. Fig. 2 provides an overview over

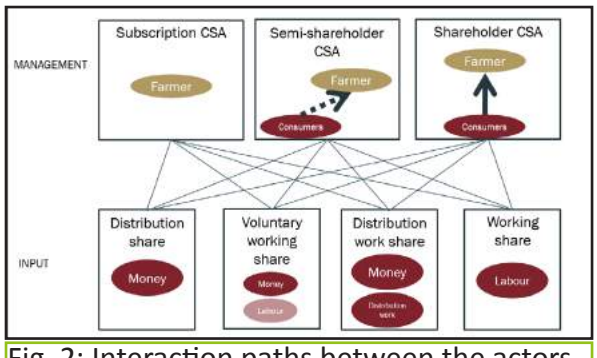

Fig. 2: Interaction paths between the actors

the different forms of organisation encountered with German CSAs (n=71).

Distribution to individual CSA members was either organized at the farm directly or at one or several distribution points in the city. Distribution frequency was usually once a week with some farms providing less often or not at all in winter. On trying to analyse the funding of the farms it was found that it has several different aspects: The composition of the financial contribution, the amount of the financial contribution, if the initiative demands a deposit, and if there is the necessity to make a prepayment.

Almost half of the German CSAs studied establish the financial contribution of every single member in so-called bidding rounds. That means that the farmer presents the financial needs s/he has for the farm and for his/her loan, then every member decides how much he or she is able and willing to spend. This process is repeated until the demanded amount of money is raised. Most initiatives give their members an approximate value though, how high the contribution of everyone needs to be to have enough funds to run the farm for one year. The amount of the monthly contribution the members must make ranges between 21 € and 190 € which means that there are substantial differences. 51 of the 71 farms found display price information on their homepage. Most (n=22) of the monthly contributions range between 21 € and 100 € though. The monthly contributions correlate with the provided range of products. Additionally, some CSAs ask for voluntary prepayments as high as possible and few have prepayment up to one year as condition for membership. A few farms also demand a deposit from their members for the duration of their membership. This is most often used to finance long term purchases for the farm, such as agricultural machines. The amount of this deposit is different from farm to farm, but most often ranges between 100 € and 300 €. Only 7 CSAs ask for prepayments of more than 100 €. The

remaining farms either ask for minor deposits of up to 100 € or only ask for a monthly contribution. Almost half of the studied CSA farms use other distribution channels for their products as well. Those channels are often local markets, farm shops, and organic food stores or even online marketing. Some farms also offer holiday flats or special events for children. Analysis if the expert interviews provided further insights: Participating in the farm work was offered by all interviewed CSAs, although it would usually only be possible to deploy members with easy tasks. All the interviewed farmers organized special working events with varying attendance of the members. As an option to improve the attendance a better training of people guiding the work activities was mentioned. Participation on the farm was described to produce benefits for the members, for the project and for the farm itself (see Table 2).

Tab. 2: Benefits achieved by participation according to the experts (n=5)

Benefits for the consumer	Benefits for the project	Benefits for the farmer/ the farm
Gains in knowledge (mentioned twice), Recreation (mentioned twice), Grest experience for children	Apprecation of the products (mentioned twice), Apprecation of the whole project, Stronger conumer-producer-relationship, Continuity of membership	Relief for the farm/ time for the farm to increase the crop variety, Apprecation of the works

Obligating the members to work on the farm was regarded controversially. The most important prerequisites would be a suitable member structure and the possibility to offer lower prices to members engaging in the farm work regularly. One expert pointed out the necessary acknowledgement of the members' time constraints, stating: "this mutual respect for what you are doing also needs to come from the farm meaning the operators of the farm."

Frequency, flexibility and location how the harvest shares are distributed are highly adapted to the local circumstances with every CSA developing an individual distribution scheme. The increase of distribution points was regarded as achievable with the precondition of enough members living close to a potential new point. The pickup of the vegetables was regarded as the minimum requirement of involvement the people must be willing to invest in the CSA. Although one expert mentioned that avoiding the pickup would be a matter of higher monthly contribution the others argued that it would help to reduce food waste since the members would be able to develop a better sense of the amount of the harvest if they could see the gathered products at the distribution point. One expert explained: "Some people might say: 'I don't like zucchini' […] But if he would simply see there are many zucchinis he might say: 'I cannot eat them all the time, but three times a year is fine with me.'' Furthermore, some of the CSAs offered the opportunity to exchange vegetables, to meet other members and to do additional shopping in a connected organic shop at the distribution point.

Except for one all interviewed experts had additional income sources such as wholesale, additional direct marketing and EU subsidies. None of those CSAs aims to abolish their additional income sources for different reasons but only one of the experts mentioned that he is economically unable to operate without it. One expert mentioned the farm shops they maintain as a method to attract new members: "[…] we use these shops as our showcase. Where the people notice that members come in, take some goods, wave at the counter and leave […] some in the shop say: 'I want that too!'". One expert raised the concern that when additional distribution channels for the farm's products exist that the CSA members will more likely end up with lower quality products than those which go into the other distribution channels.

Most experts agreed that the concept of CSA also has a good perspective without ad-

ditional distribution channels because of the increasing number of critical consumers. For a successful establishment of a CSA the experts mentioned:

- availability of enough members
- professionality of the founders
- cooperation with other CSAs

The experts precluded the possibility to establish more flexible conditions such as short-term memberships of less than one year financially balanced by other distribution chains.

To provide a fair share for all members and planning reliability for the farmer it would be necessary for all members to experience months of plenty and months of less harvest. Only a discount system was suggested with the help of other distribution channels. Payment structures are handled depending on size and membership structure. The models range from monthly prepayment to larger prepayments or voluntary loans for one year. Minimum membership (except for one CSA) is one year. Opinions on the price advantage were varied. One expert said: "For those – and that is what I heard from the members – who exploit their share completely by using all vegetables available and who process and preserve vegetables in times of plenty, for those members I would say it is remarkably cheaper than to purchase the food via normal trade." Some experts emphasized that the aim of a CSA was to decouple food production from the price-performance ratio. Therefore, the price advantage should not be made a topic when promoting CSA as a concept.

To convince the CSA's members of substantial monetary contributions the experts named several arguments:

- transparency (mentioned three times)
- fair wages (mentioned twice)
- solidarity
- the farmers focus on quality instead of economic interests
- support of a good project
- uncommon, quickly perishable crops which are usually not available in shops
- high variety of crops (which is labour intensive and therefore increases the monetary contribution)
- environmentally sound agriculture

Generally, the members would not complain about the amount of the financial contribution. A reason to quit the CSA membership would rather be that the harvest share is not adaptable into a person's everyday life.

Discussion

The amount of people worrying about food safety was slightly higher among the respondents with children in Shanghai. If concern with food safety is regarded as a reason to start a CSA membership, families with children could be in the focused of their promotion. It has also been reported before that especially families with children profit from a CSA membership (Cooley & Lass 1998: 229). Parents participating in a Chinese CSA even mentioned that they are mainly participating in a CSA to provide for a better understanding of food production for their children (Chen 2013: 39–41). On the other hand, children might also be an obstacle for joining a CSA as households without children might have more time to spend (Kolodinsky & Pelch 1997: 139). One of the German experts also mentioned that children might refuse to eat some of the vegetables produced which makes it complicated for a household to consume the whole harvest share. Since the majority of the respondents are interested in participation on the farm the importance of the recreational value which would be expected from a CSA project should be regarded for implementation. Since the interest in participating with the management work of the farm was rather low it is likely that potential members perceive CSA as a service provider not only for vegetables but also for leisure time activities. Furthermore, extent of participation

also varied with the family status of the respondent. Studies have repeatedly highlighted the value of participation and recreation of CSA (Chen 2013, Cooley & Lass 1998: 228; Hayden & Buck 2012: 337). Therefore, I argue that for the people who were not interested in any form of participation, CSA would not be an appropriate concept. One major problem concerning the implementation of a CSA in Shanghai is the low willingness to make prepayments for the food. This might have to do with the low level of information the participants of the survey received about CSA but is also something which was observed as a problem of Chinese CSAs before (Shi et al. 2011). However, the financial security provided by the consumers' prepayments for the farmer is a strong incentive for the producer side and one of the corner stones of the CSA concept (Hayden & Buck 2012: 333). To ensure funding the producers will have to render additional efforts and benefit less than from a model where they provide only for the CSA members. Eventually, this might make CSA in the context of Shanghai a rather one sided approach towards consumer demands and not a tool for rural revitalisation. Home delivery was rather popular among the respondents but statements about picking up the food were contradictory. Those answers are probably connected to the size and transport structure of Shanghai. Home delivery of fast food, for instance, is very common and the possibilities to eat out are manifold. These local structural issues should be regarded when implementing a CSA in Shanghai. The differences in the frequency of deliveries might be connected to the respondents cooking and eating habits. The capability of engaging members in the farm work is closely tied to the experience and expertise how to integrate them. The CSA with the highest member attendance for the farming events was also the one with the longest experience among the interviewed experts. Another ex pert mentioned that ideally the members should be guided by a person trained in pedagogics to ensure a satisfying farm experience for them. The difficulties of member's presence on the farm was also highlighted in one study where on-farm participation was connected to unpleasant experiences for the members. The members in this study also mentioned their wish for a better guidance of participation (Hayden & Buck 2012: 339). Thus to integrate the members successfully knowledge either gained by experience or by training or education plays an important role. Furthermore, if the members are already taking care of the distribution work there might be less motivation to also take part in the actual farm work. The experts who stated that their members do not have to participate in the distribution work also reported a higher attendance at participation events. A variety of named benefits shows that participation in the farm work is an important asset of a CSA. Consequently, the opportunity should be given. Nevertheless, compulsory participation is neither wanted by the interviewed farmers nor an option for many people due to busy schedules (Pole & Gray 2013: 97). Frequency and organisation of distribution points were reported to be individually adapted to the situation the farm is working with. The distribution of households within the catchment area of a CSA contributes to the chosen localities. According to two of the experts it is important for the members to see several harvest shares at the pick-up point to prevent food waste. If, however, a CSA project decides to establish a home delivery scheme they should ideally develop a concept to deal with a potential waste of food, as the decrease of food waste was named one of the major advantages when food is picked up by the members directly. Other advantages for a self-pick-up of the food are the opportunity to socialize with other members as also found by Hayden & Buck (2012: 336). The variety of distribution chains these different CSA use shows that there are manifold ways how to establish a second means of support for a CSA, when an economy only dependent on CSA seems too unstable.

If those distribution chains are communicated transparently to the members, they might even profit from it. Since only the expert of the largest (in terms of members) and oldest CSA mentioned it as a possibility more flexible contracts might be a question of size and experience of a CSA. In most cases they were reported, though, to jeopardise the concept of CSA too severely. According to some of the experts the price advantage of CSA should generally not be in the focus of the consumers. This is supported by one of the oldest references on CSA where the author states that the aim is not "to buy at the lowest possible price." (Lamb: 7). Since, according to the experts, there are plenty of other good arguments to convince the members of the financial contribution it might not even be necessary to mention it. As other farmers were not even sure if there is a price advantage or said that it depends on the ability of the members to consume the share it might be an aspect the members should find out for themselves and relate it to their eating habits. An alternative to the argument that CSA is cheaper might also be to teach the members with courses on the farm or newsletter articles how to make the most out of their shares. The fact that almost all the five interviewed farms ask some of their members to make larger prepayments or to give them an annual loan shows that not all the expenses of a CSA can be covered with only monthly payments. This is especially true for the first few years of a CSA in which larger investments are due such as the procurement of agricultural machines.

Conclusion

The quantitative survey of staff members, architects and a few students all affiliated with Tongji University in Shanghai showed that the participants have awareness about food safety and the willingness to purchase green food. The high price sensitivity which is already mentioned in the literature (Liu et al. 2013:100; Shi et al. 2011: 554; Scott et al. 2014: 163) was also an issue for the respondents of the study.

Due to the low interest in management work and a general obligation to help with the farm work a Subscription CSA with a Distribution share seems to be the most viable option for Shanghai. The participants of the survey had high expectations towards the recreational value of a CSA. However, the expert's mentioned that successful integration of members is complicated. Therefore, I argue that guided participation is also an important keyword for a CSA established in Shanghai.

To finance the farm a new payment model must be developed which provides security for the farmer without necessitating larger prepayments for the members. This experience was already made at a CSA in Beijing where they had to manage without prepayments at least in the beginning (Shi et al. 2011: 554).

Finally, another special characteristic of Shanghainese CSAs might be that they require home delivery of the produced food. The research about CSAs in Germany showed that there are deviations from the clear distinction into Shareholder and Subscription CSA as well as Distribution and Working Shares. This suggests that CSA is an adaptable concept and that some alternatives identified are almost suitable for the demands of the Shanghainese target group.

The coexistence of different CSA models might be a sufficient solution for different expectations towards a CSA. This impression was also confirmed by the experts of whom some said that the success of a CSA strongly depends on the availability of members. As Shanghai probably has a lot of potential CSA members due to its size these findings gain relevance.

The same accounts for obligating members to farm work. If the members generally have more time than economic resources a concept with a higher participation might make

sense. At a CSA in Beijing these different demands are implemented by different shares, which even include plots for own cultivation (Shi et al. 2011: 554). Since most respondents of the study expressed their interest in participation they are also likely to profit from a potential CSA in Shanghai beyond the supply of organic food. Advantages which are connected to picking up the food by the members will most likely be missed. The preference for a box delivery of the products was very strong among the respondents. The difficult infrastructure, the size of the city and the high prevalence of delivery services will make a model with a personal pick-up very difficult. A CSA in Shanghai would have to think about alternative ways to achieve the connected advantages in a different way.

The respondents of the survey in China were willing to spend 1.300 RMB (about 175 €) a month, for a CSA membership. Only rough estimations about a realistic monthly contribution of a CSA in Shanghai can be made by the author. Assuming that – compared to Germany – higher land prices are evened out by lower labour costs the 175 € are probably realistic. The willingness to pay a certain price in combination with the demand for additional values of a CSA could be evidence that the Shanghainese respondents already understood that CSA is not necessarily a cheap access to ecological food and that they are funding a project instead of just receiving goods in exchange for money. It also suggests that they strongly value knowing about the origin of their food. The high willingness to pay could also be a good option to finance the food delivery and additional staff for the educational supervision of members visiting the farm. The problem concerning the funding of a CSA farm according to the findings of this study is not the general willingness to pay but the commitment concerning the duration of the membership. The arguments that German experts use to convince their members of the height of the financial contribution could be adapted to convince new members of the necessity of a longer commitment. A commitment for at least one year was mentioned by the experts as an essential part of a CSA membership and as a precondition to keep the farm running.

The question is how much the concept of CSA can be adapted before it no longer conforms to the principles of a CSA anymore. On the homepage of "The International Network for CSA" (URGENCI) it says that local models of CSA are different, but they could be framed under: "Active citizens are making a commitment to local farms to share the risks and the bounty of ecological farming." (Henderson 2010). This leaves some space for possible initiators of a CSA in Shanghai to adapt the concept to their local demands.

Concerning alternative distribution channels or other sources of income for CSA farms, plenty of solutions can be found in Germany. Nevertheless, according to the experts, additional distribution channels also have negative aspects such as the possible misuse of the CSA members as consumers for less appealing vegetables.

As the willingness to make prepayments was low among the survey's respondents a newly founded CSA project in Shanghai will probably have to deal with the question how to finance long term purchases such as agricultural machines. Voluntary prepayments or loans could be a solution before opting for bank loans or government aid.

The most practical frequency in distributing the food is deemed once a week; that opinion was shared by most of the interview respondents as well as the experts. CSA is most successful when established bottom-up (Lovell et al., 2010: 332). The conclusion from this must be that a suitable adaption of the CSA concept is most important, when introducing CSA to Shanghai. I argue that applicable approaches can be found among the CSA farms in Germany and that the expert interviewed had applicable experiences to share. Never-

theless, when adapting the concept of CSA to Shanghai one should be highly sensitive to the local demands instead of rigorously implementing a model from Germany.

The quantitative research in Shanghai showed that there are in fact specific values and demands Shanghainese consumers have when considering a CSA compared to what is offered by the studied German CSAs. These differences must be payed attention to when establishing a CSA in Shanghai.

Countries in which CSAs are more common like the USA or the UK for instance usually have umbrella organizations which organise an exchange and provide frameworks for their member CSAs. As China is a huge country with local disparities such as climate as well as cultural aspects it is questionable if it makes sense to establish one network which provides the framework for all Chinese CSAs. Alternatives could be to establish networks within the different provinces or to differentiate between rural and urban CSAs. Also, the cooperation between different farmers is something which should be investigated if it makes sense in the Shanghai region.

Outlook

As the experts described the pick-up of the harvest share by the members as essential and valuable part of a CSA it would be interesting to know how this is perceived by the members of a CSA in Germany. To maximize the gain of additional values, members achieve from a CSA it would furthermore be helpful to do some research about the integration of members into farm work and activities on the farm. It would be important for the farmers to know how the work needs to be organized to decrease fatigue and to increase recreation and gain of knowledge for the members, for instance. The next step for the implementation of a CSA in Shanghai would be to find out in which parts of the city there is an actual demand for CSA-memberships. With this knowledge it would be easier for a potential CSA to allocate distribution points or even the farm itself.

Instead of letting the concept of CSA fail because of too high idealistic expectations in its members, the concept should be adapted to the local demands. A CSA like that might develop and mature with its members and evolve into a more sustainable and profitable CSA within the years. Nevertheless, even though CSA is an elastic concept there are limitations at some point. The question might be: Is the concept stretched to be more amenable (and develop over time) or is it simply violated for commercial purposes? CSA is not a one-sided approach which only consumers should benefit from. Therefore, the producers' demands should be further researched

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Ilka Beith

New Challenges and Opportunities - Decommissioning of Offshore Oil and Gas Structures

State of the Art

Abstract: As many offshore oil and gas installations are coming to an end of their production, decommissioning is getting more and more important. Depending on the type of the offshore structure, different decommissioning methods and technologies are used. Due to the fast development of technologies more and more methods of decommissioning are available. Irrespective of the method used, environmental assessments need to be considered to make sure that all aspects of the environment are deliberated. Moreover, the advantages and disadvantages of the Rigs-to-Reef program as one opportunity of a partial removal of offshore structures is discussed. However, it is the network of international, regional and national laws and policies that play an important role in making decisions, although the topic is still in its infancy which makes it hard to identify the best solution. Thus, it is important to note that decommissioning is a long and difficult process, where no single solution can be applied since all platforms are unique.

Keywords: offshore oil, gas structues, decommissioning, Rigs-to-Reef program

Introduction

When Shell wanted to dump the oil platform Brent Spar in the deep sea, 250 km northwest of Scotland in the year 1995, Greenpeace called people´s attention. This resulted in people boycotting Shell fuel stations, but also gaining political attention on a European level. Shell decided otherwise and shipped Brent Spar to Erfjord (Norway), where it was cleaned and reused (just the foundation) for a ferry terminal. Consequently to this event, the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) followed in 1998 (Weyler 2016). Dumping was history and instead, companies had, have and will have to deal with decommissioning of their old offshore installations. As the production peak of North Sea oil and gas has already been reached decades ago and sustainable energy sources becoming more and more important according to climate change, oil and gas companies focus on decommissioning of their old offshore installations now. Whereas there were 1212 active offshore oil and gas platforms in the North Sea in 2009 (Jørgensen 2011), in 2014 only 776 active offshore structures were remaining (Todd et al. 2016). In 2009 already 129 installations had been decommissioned. Most structures in the North Sea belonging to the UK (612) and to Norway (354) (effective 2009) (Jørgensen 2011). Worldwide over 7,500 offshore structures need to be decommissioned in the next decades (Claisse et al. 2015). Decommissioning of offshore installations already started world-wide and will last for the next twenty years (Todd et al. 2016). The decommissioning sector is already creating fulltime jobs for highly educated people and will even create more in the future (Shell no date). Offshore decommissioning is much more expensive and challenging than onshore decommissioning, according to the challenges of water and pressure (Kaiser 2015). Depending on the source, the costs for decommissioning vary from 30 billion to 75 billion pounds for the next two decades in the UK, split between tax payers and the oil and gas companies (Shell no date). At the moment the decommissioning of the four Brent Field offshore installations in the North Sea (Alpha, Bravo, Charlie and Delta) by Shell is a very big deal in the UK (Shell no date) and for that reason it is used as an example later on.

Ilka Beith

Types of offshore platforms

There are different types of offshore oil and gas installations around the world. The first off-shore structure was a fixed conventional platform with a steel jacket, installed in the Gulf of Mexico in 1937 (Day 2008). The first concrete platform was constructed in the North Sea in the Ekofisk field in 1973 (El-Reedy 2011). Depending on climate (e.g. frost, ice), environmental hazards (e.g. hurricanes) and water depth, producing oil and gas offshore always created and will create challenges in engineering. Drilling oil and gas offshore under harsh conditions, for example in the North Sea or Arctic, involves a lot of technologies and also man power. It is to notice that water depth rates of installations are changing as technologies developing more and more (El-Reedy 2011). As shown in Fig. 1 there are three main types of installations: fixed conventional platform (either steel or concrete), tension leg platform and floating production system. The main difference between them: the fixed conventional platform is anchored to the sea bed, whereas the tension leg platform (TLP) is a "buoyant production facility vertically moored to the seafloor by tensions" (Rigzone no date). Fixed conventional platforms have either a steel jacket or a concrete structure and usually provide oil storage facilities. "Conventional TLPs have four buoyant hulls with hollow columns in which ballast is injected and withdrawn to adjust the tension in the legs" (Kaiser 2015). The tensions allow horizontal movement (wave action), but no vertical movement. Therefore, the installations shall also last hurricanes, as they are quite stable. Hence, many of the TLPs are installed in the Gulf of Mexico, an area characterized by hurricanes (often TLPs do last hurricanes, but hurricane Rita destroyed the Typhoon mini TLP in 2005) (Kaiser 2015). Moreover, the TLPs can be installed in different water depths and therefore are suitable for deeper waters (Rigzone no date). The floating production storage and offloading system (FPSO) is a floating facility based on a ship with storage for oil. It allows 360° rotation and remains stable during storms (Bluewater 2016). Other structures as e.g. compliant tower structure, semi-submersible platform do exist as well. Compliant towers are more stable than fixed platforms, in so far as they allow water movements to a certain point, although they are secured with piles to the ground. Usually, they do not have oil storage facilities (NOAA 2013).

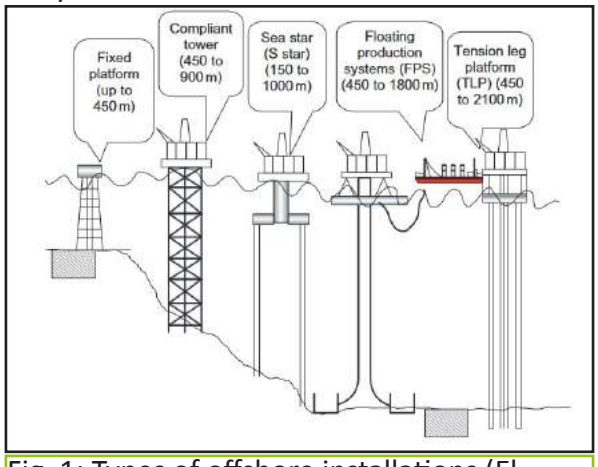

Fig. 1: Types of offshore installations (El-Reedy, 2011)

Decommissioning process

When the exploitation of oil and/or gas on a platform is coming to an end, the company needs to make a decision about the future of this installation (Fig. 2). The offshore installations can be reused as fish farms, marine laboratories, weather stations, tidal and wind power generations, oil landing stations or may be used for military issues (Day 2008).

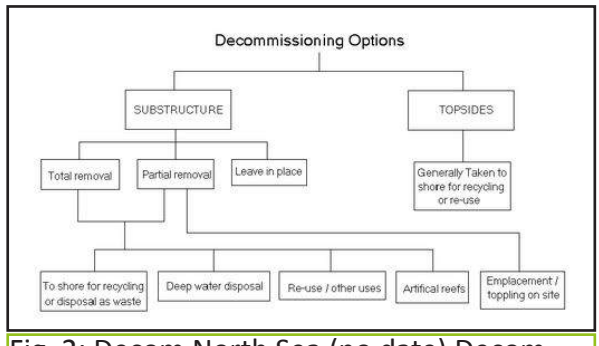

Fig. 2: Decom North Sea (no date) Decommissioning Options - Members only

For example, in case of the four remaining offshore platforms in the Brent Field, Shell thought about alternatives for decommissioning the platforms (e.g. offshore prison). But, according to the distance to shore and age of infrastructure, the conclusion was made that decommissioning is the best solution (Shell no date). The conditions of the offshore installation is crucial for further decisions, therefore monitoring are essential. The process of decommissioning is also influenced by climate and water depth. In moderate environments, e.g. the Gulf of Mexico, West coast of Africa, Persian Gulf and the Mediterranean Sea, and an average water depth of 3 to 300 meters, the process of decommissioning is much easier and a total removal of the structures is most likely (Day 2008). It is to point out that offshore decommissioning is always creating risks, for humans as well as for the environment. Therefore careful planning and risk assessment are crucial (Kaiser 2015).

There are different decommissioning options available. As shown in Fig. 2 decommissioning can take place by total or partial removal of the installation (Laver 1992; Day 2008; Wu et al. 2014).

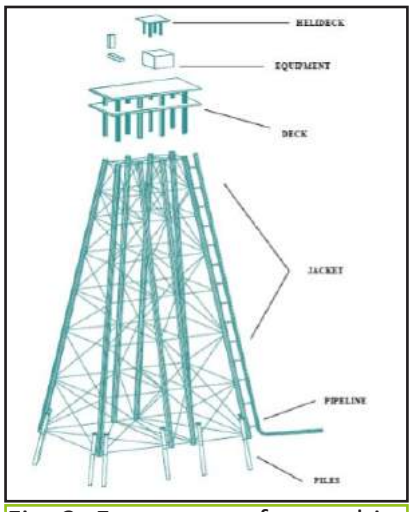

Fig. 3: Fragments of a steel-jacket structure (Wu et al., 2014)

A fixed platform consists of the topside (helideck, equipment, deck), the jacket and pipes (Fig. 3). Drilling equipment, oil rig and living facilities for workers are part of the topside. Often they have a heliport for helicopters as well (Shell no date). Topsides are generally taken to shore for recycling or re-use. The treatment for the substructure varies. Either the sub-structure is removed in total, partial or is left in place (Laver 1992; Day 2008; Wu et al. 2014). When totally removed, the substructure may be taken to shore for recycling or waste disposal or be dumped in a deep water disposal. Other options are used as artificial reefs or emplacement/toppling on site (Fig. 2). Artificial reefs are created by the jacket and often create hard bottom habitats for marine life. Creating hard bottom habitats means also providing environments for a lot of marine species (see chapter: Rigs-to-Reefs program). For example, in the Gulf of Mexico, a lot of hard bottom habitats are created by offshore installations. Nevertheless, the choice of the method is also depending on “costs, proximity to disposal sites, availability of removal equipment, shipping lanes, fishing interests, safety environmental issues” etc. (Day 2008). Not to forget the influence of political issues in a country. When decided for a decommissioning process, a lot of preparation is essential. Depending on a type of the offshore platform, the availability of equipment for removal and the legal requirements, the decommissioning process differs (Day 2008). The decommissioning of fixed platforms creates challenges for engineers. According to the weight of concrete structures, there are even more difficult to decommission (Gorman and Neilson 1998). As decommissioning may cause environmental pollution, it is crucial to do analyses for all stages of the decommissioning process (e.g. checking the structure legs for damage). During the monitoring and the risk analysis, the structures are checked for debris of radioactive materials, PCBs, sludge and slop oils (Day 2008). When toxic waste is detected, it is transported in drums to disposal wells or approved landfills. The pipes are cleaned and decommissioned on land (Day 2008). Before the removal of the topside, all processes are shut down and the equipment

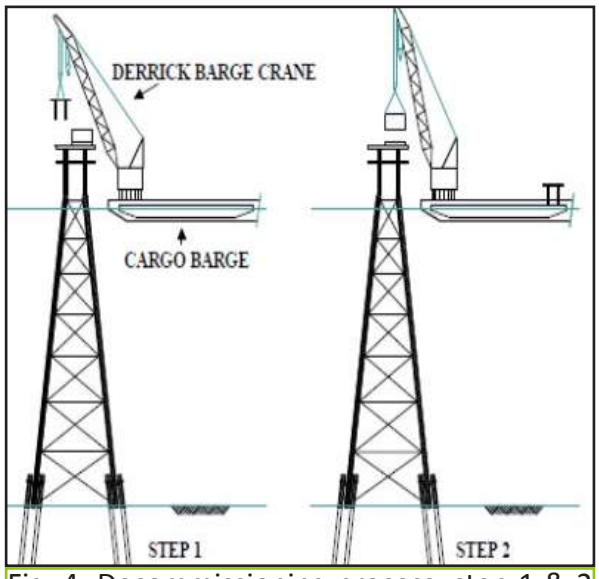

Fig. 4: Decommissioning process, step 1 & 2 (Wu et al, 2014)

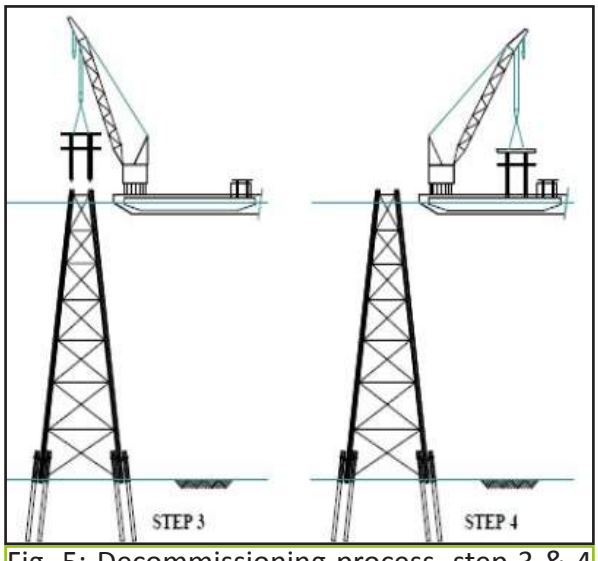

Fig. 5: Decommissioning process, step 3 & 4 (Wu et al, 2014)

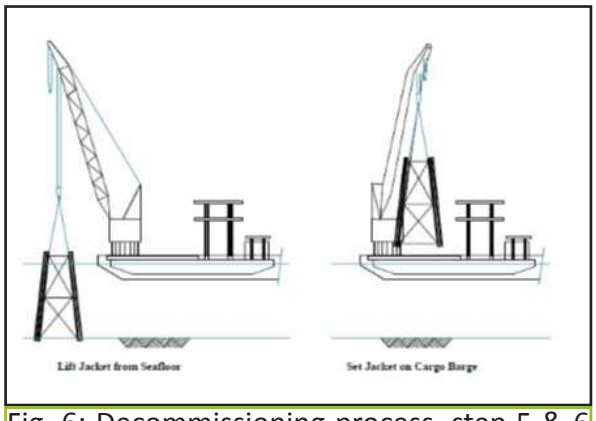

Fig. 6: Decommissioning process, step 5 & 6 (Wu et al, 2014)

and facilities are moved away. After that, the topside is cut loose from the jacket (Fig 4). When the structure is installed in shallower waters, the cuts can be done by skilled divers using underwater burning equipment or when it is settled in deeper waters by using remotely operated vehicles (ROV´s) (Day 2008; Wu et al. 2014). The whole topside can be lifted by a heavy lift crane vessel (HLV) up on a cargo barge and transported to the mainland (Fig. 5). Or the topside is cut into smaller pieces and can then be lifted by hydraulic cranes. With high pressure water cuts (200 – 400 bar), the jacket is cut out from the seabed and lifted into a cargo barge (Fig. 6) (Day 2008; Wu et al. 2014). When decided for a complete removal, a final clean-up of the seafloor needs to be done in the end. This includes taking out debris and other alien elements left on the seafloor. By using high-frequency sonar, skilled divers and/or ships simulating trawling, the situation of the sea bed is checked (Day 2008). When decided for toppling the topside in place, the topside is sunk next to the jacket, leaving a clear water column of 55 m, as these are international rules (Day 2008; Wu et al. 2014). For deep-water dumping the structure must be free of hydrocarbons to make sure no environmental pollution is happening. When performing deep-water dumping, the structure is anchored to the bottom of the deep seafloor, floated and sunk (Day 2008).

Decommissioning of the Brent Field structures in the UK

As the Brent Field in the North Sea is an actual decommissioning site in the UK, it is used as an example for decommissioning. The Brent Field (Brent covers Jurassic age group: Broom, Rannoch, Etive, Ness and Tarbert formations) is one of the biggest offshore oil production fields in the world and is operated by Shell (Beckman 2012; Shell no date). It is situated ca. 180 km north-east of Lerwick, Scotland. The huge production platforms are installed in a depth of 140 m. During the production

Fig. 7: Brent Field offshore structures Alpha, Bravo, Charlie & Delta (Shell, no date)

peak in the year 1982, the Brent Field produced half a million barrels of oil per day and the production in this year alone could have provided the annual amount of energy for half of the UK. Furthermore, it has a large pipeline system (Beckman 2012; Shell no date). The field gained worldwide attention in the year 1995 with the decommissioning of the Brent Spar (as mentioned before) (Weyler 2016). Today the other four platforms, Brent Alpha, Brent Bravo, Brent Charlie and Brent Delta need to be decommissioned in terms of aging (Fig. 7) (Beckman 2012; Shell no date).

The production on Brent Delta stopped in December 2011 and on Brent Alpha and Brent Bravo in November 2014 (Shell no date). Three of the production sites are concrete gravity base structures and one is a concrete steel jacket structure (Brent Alpha). All topsides together weigh over 100,000 tons. According to the OSPAR decision 98, every topside needs to be taken off and carried to the mainland for dismantling, recycling and/or disposal. The gravity base structures weigh 300,000 tons each. In 2015 it was decided that the Delta topside is going to be lifted in one section only by usage of a heavy-single-lift vessel (Shell no date).

Coming to the process of decommissioning the Brent Field: Scafford poles and fragments are detected by Remotely Operated Vehicles (ROVs) and collected in buckets. Often oil and other debris have been accumulated in the cells of the oil platform. Therefore, it is useful to know the composition of the material left in the cells. Hence, some samples have been taken from the cells of Brent Delta. In a depth of 80 m, base plates have been installed by divers on the concrete structure of the cells. By usage of ROVs, drilling tools were devoted to these base plates, so samples could be taken. The leftovers found in the cells is a combination of attic oil, a stable emulsion of water and oil and a mixture of oil, sand and other particles (Shell no date). Now different options are available in terms of decommissioning the substances in the cells. The debris could be pumped out and then stored offshore in a special disposal well or stored in tankers and shipped to the mainland for waste disposal treatment. But in terms of technology, this process is very difficult to manage, as it is not easy to drill through the 1m thick concrete wall and pump out a 120 m high structure and is very risky in terms of industrial and environmental safety (Shell no date). Another option is bioremediation, which indicates that nutrients are added to the substance to expedite bacteria growth resulting in a faster oil components breakdown. But Shell wants to leave the cells in place until they will collapse in the future. It is likely that these storage cells remain in the sea for 1000 years (Shell no date). After numerous studies and risk assessments, Shell came to the conclusion to leave the legs in place as this is safer for workers and for the environment. It is also less pricy for the company. The area will be marked in charts for shipping and fishery and still be handed as a safety zone. Although the OSPAR decision 98/3 requires a partial removal of 55 m below sea level of every offshore installation, Shell is able to get an exception in terms of safety risks. After flushing the pipelines, Shell wants to remove some of them, but also leave some in place and cover them with rocks (Shell no date).

Ilka Beith

Decommissioning in the USA

Since the Deep Water Horizon accident in 2010, oil and gas exploitation in the Gulf of Mexico got a lot of public attention. Most of the domestic oil and gas resources of the USA occur in the Gulf of Mexico, hence thousands of offshore oil and gas platforms are installed in this area (Fig. 8). As oil and gas have been drilled for the last 60 decades, the resources closer to the mainland depleted, so that ultra-deepwater (> 5000 feet) production increased. Today over 80 percent of offshore oil and over 50 percent of gas is produced in deep waters in the Gulf of Mexico. Since 1973, 4,500 installations in a water depth down to 400 feet have been decommissioned (Kaiser 2015). The deeper the installation is settled, the more difficult is decommissioning and also equipment and underwater activities are more costly. Hence, decommissioning of TLPs is most expensive (Kaiser 2015).

Fig. 8 Active offshore platforms in the Gulf of Mexico (NOAA, 2013)

Rigs-to-Reefs (R2R) program

One decommissioning option is the Rigs-to-Reefs program (R2R). For the Rigs-to-Reef program, uncontaminated sections of the offshore structure are left in place, the structure is either cut off at the top and placed next to remaining installation or the whole structure is laid on its site, also named toppling or moved somewhere else (Fig. 9).

Different countries have variant legislations

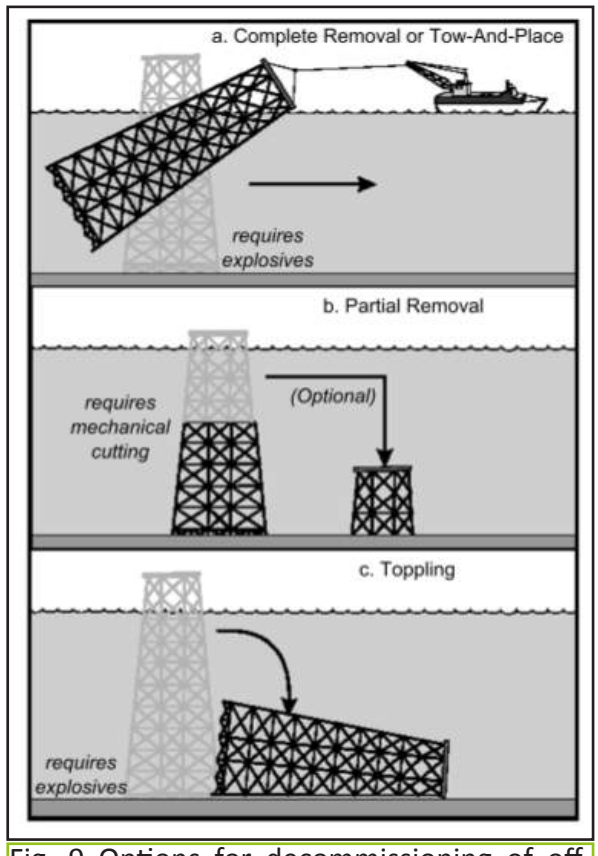

Fig. 9 Options for decommissioning of offshore structures (Claisse et al., 2015)

and regulations for decommissioning of offshore structures. The US policy allows R2Rs in the Gulf of Mexico as well as in California, whereas in the North Sea R2Rs are still prohibited (Jørgensen 2011). The OSPAR legislation shapes the North Sea artificial reef policy. Therefore, all waste as source material is rejected and the use of offshore installations as reefs is prohibited (OSPAR 1999a, cited in Jørgensen 2011). Norway did not agree to this regulation. Germany and Spain were the countries forcing OSPAR convention to these rules, as they were aware of companies using the R2R program as a cheap and comfortable method to get rid of their dump in the sea. Hence, "Rigs-to-Reefs in the North Sea is equal to illicit dumping of offshore structures" (Jørgensen 2011). When trading off R2Rs against other decommissioning opportunities it is important to clarify the ownership and liability of the remaining structure (Baine 2002). In California, it is handled that way, that the company donates the left installati-

on to the state of manage as an artificial reef, while maintaining financial liability in case of a leak (Jackson and Callahan no date). Before decision making in any decommissioning process, an Environmental Impact Assessment (EIA) needs to take place. In terms of R2Rs, an Ecoreef Impact Assessment is valuable (Fig. 10). Environmental impacts, as well as socio-economic impacts, need to be adequately taken into account. Additional effects over short-term and long-term need to be taken into consideration. Mandatory is that positive impacts must outweigh negative ones (Cripps & Aabel, 2002).

As mentioned before, offshore structures supply habitats for marine species as they provide protection from predators and a basis for settlement. Studies of the impacts of offshore struc-tures on marine fish species surveyed an increase in fish population in biomass and stock production over time. Moreover, fish populations have reduced mortality during growth as structures providing protection (Cripps & Aabel 2002; Claisse 2015). For example, in the North Sea it has been surveyed that large schools of mackerels, cod and saithe surrounding the oil platforms (Soldal et al. 2002). Moreover, at some structures in the North Sea fragile cold water corals can be found (Gass & Roberts 2006, cited in Jørgensen 2011). Additional sessile invertebrate fauna as barnacles, sponges, anemones, mussels etc. accumulate to structures. As an example, Southern Californian Bight oil platforms have a biotic layer of 0.5m thickness, extending from the surface of the structure to over 30m depth (Schroeder & Love 2004). Even fisheries are profiting from offshore structures in the further distance because of fish agglomeration (vessels need to stick to a safety distance of 500 meters) (Cripps & Aabel 2002; Claisse 2015). In the Gulf of Mexico, 188 decommissioned oil platforms were transformed to R2Rs since 1947. Their number is still increasing (Claisse et al. 2015). Moreover, these R2Rs are enjoyable sites for recreational SCUBA diving, as the waters are warm and shallow (Fig. 11, 12). Using R2Rs as recreational dive sites are efficient in areas close to the cost and reachable by dive operators during the day only. Furthermore, R2R sites in the US developing more and more to Marine Protected Areas (MPAs). There are different kinds of MPAs, reaching over fully protected areas to multiple-use zones. Mostly for the R2R areas, take and no-take zones are combined, allowing recreational SCUBA diving (Ekins et al. 2006).

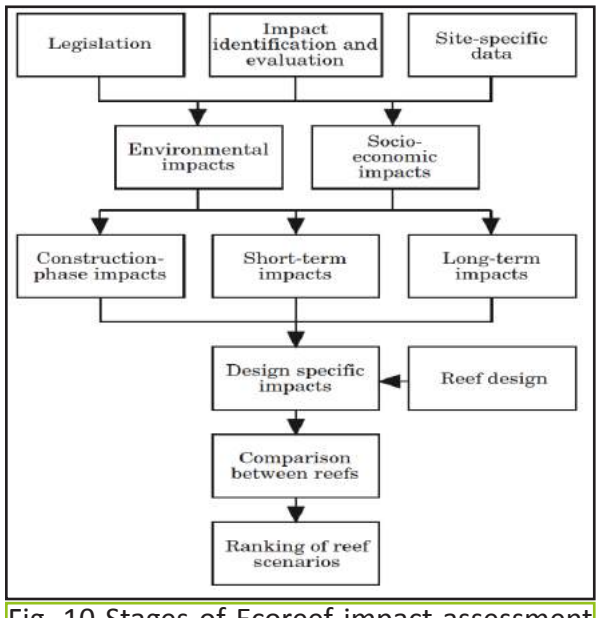

Fig. 10 Stages of Ecoreef impact assessment (Cripps and Aabel, 2002)

Discussion: Do Rigs-to-Reefs work for the North Sea?

R2Rs are very efficient in the Gulf of Mexico, but would they be in the cold North Sea, where most of the offshore installations in the EU are settled? It needs to bear in mind that offshore structures in the North Sea also lead to higher fish biomass and agglomeration (as studies have shown) and therefore artificial reefs can be a positive development in most terms for the fishery. Nevertheless, more ecological and biological monitoring along the offshore platforms should be done. In terms of recreational diving it is unlikely that it would be beneficial in the North Sea as most installations are way too distant from the mainland, which

makes it uncommercial for diving operators to get there not to mention the harsh weather conditions of the sea. However, OSPAR should exclude artificial reefs created by offshore structures from the prohibition under strict regulations making it impossible for companies to just “dump” their platform into the sea and building reefs wherever useful in terms of environment and ecology.

Conclusion

Offshore decommissioning is challenging in terms of technologies, human health, and environmental risk. For each type of offshore installation a variety of decommissioning methods can be used, but there are still case to case studies necessary as every installation, differs in terms of water depth, climate zone, political and technological requirements, current condition and waste disposal sites availabilities. It is not easy to perform total removals of offshore platforms, especially when they are large and heavy. Decommissioning concrete based structures and tension leg platforms are the most challenging processes. Nevertheless, in the future, there will be an increase of more and better decommissioning methods and technologies. The Rigs-to-Reef program is an efficient alternative in the warmer waters such as Gulf of Mexico and California and has considerable advantages both environmentally and economically. Most profiting users of artificial reefs are recreational divers and fishermen. The efficiency of R2Rs program in the North Sea is in most cases questionable. However, artificial reefs built by offshore structures should also be provided a chance in the North Sea. Common days are very interesting times in terms of decommissioning, especially in the North Sea and much more progress needs to be done.

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Thomas Held

Die Welt der Rohstoffe

Neukirchen, Florian; Ries, Gunnar (2016)

Rezension

Die Autoren – beide verfügen als Hintergrund über ein Studium der Mineralogie – verfolgen mit dem vorzustellenden Werk laut eigenem Bekunden ein „unkonventionelles Konzept […] im Spannungsfeld zwischen populärwissenschaftlichem Sachbuch, Lehrbuch und Nachschlagewerk“. Als Adressaten werden „hauptsächlich Fachfremde“ genannt. Ferner wird der Anspruch formuliert, den aktuellen Forschungsstand entsprechend darzustellen. Vorsorglich wird einleitend noch darauf hingewiesen, dass geologisches Grundwissen bei der Lektüre hilfreich sein könnte. Insofern wird der Erwartungshorizont durch die kurzen Vorworte zur 1. sowie zur 2. Auflage abgesteckt.

Bereits auf der ersten der 332 Textseiten wird erwartungsgemäß deutlich, dass ein klassischer Ansatz mit der Besprechung mineralischer Rohstoffe sowie der fossilen Energieträger Erdöl, Erdgas und Kohle verfolgt wird. Andere denkbare Rohstoffe wie beispielsweise Agrarrohstoffe oder gar Daten - der „Rohstoff des 21. Jahrhunderts“ - werden nicht behandelt. Diese Einschränkung tut dem Werk gewiss keinen Abbruch, nur sollte der Unterschied zu inhaltlich umfassenderen Angängen[1] bewusst sein.

Der Ansatz wird in sieben Großkapiteln, die sich wiederum in zahlreiche Unterkapitel aufteilen, umgesetzt. Das erste Kapitel, die „Einführung“, umfasst 49 Seiten. Inhaltlich geht es über eine bloße Einführung weit hinaus. Hier wird das angesprochene unkonventionelle Vorgehen sichtbar. Das Kapitel beginnt nicht, wie möglicherweise bei einem klassischen Lehrbuch zu erwarten wäre, mit grundlegenden Fakten wie der Zusammensetzung der Erde und der Einteilung in Elemente, sondern es endet damit. Vorangestellt werden Ausführungen zu Erzen, und es folgt eine Übersicht zu Ressourcen und Reserven, Märkten, Explorationsmethoden oder Abbauverfahren. Umweltaspekte und Gedanken zur sozialen Verantwortung finden in diesem einführenden Teil ebenso Platz wie die Aufbereitung und das Recycling. Angesichts volatiler Weltmärkte und schneller technischer Entwicklungen können solche Darstellungen zumindest in Teilen immer nur eine Augenblicksaufnahme sein, doch bietet dieser Teil insbesondere für Fachfremde eine gute Zusammenfassung der facettenreichen Thematik.

Die folgenden Hauptkapitel behandeln „Die Welt der Metalle“ (S. 49 - 77), magmatische (S. 79 - 141) und hydrothermale Lagerstätten (S. 143 - 227) sowie Lagerstätten durch Sedimentation und Verwitterung (S. 229 - 276). Zwei Kapitel zur fossilen Energie und zu Industriemineralen, Steinen und Erden beschließen das Buch. Jedes Kapitel schließt mit einem eigenen Literaturverzeichnis, während allgemeinere weiterführende Literatur am Ende empfohlen wird. Letztere begnügt sich mit einer halben Seite, während die den Kapiteln zugeordnete Verzeichnisse teils recht umfangreich sind und gemäß dem eingangs erwähnten Anspruch des Buches über den aktuellen Forschungsstand informieren. Dieser Aufbau hat den Vorteil, dass die jeweils relevante Literatur eine unmittelbare Bindung zum besprochenen Sachverhalt besitzt; allerdings fehlt

1 Zu nennen sei hier exemplarisch: Barsch, Heiner; Bürger, Klaus (1996): Naturressourcen der Erde und ihre Nutzung. 2. überarb. und erw. Auflage. Gotha.

dadurch ein Überblick über die Quellenlage am Ende. Diese unterschiedlichen Möglichkeiten zur Verortung der benutzten Literatur werden immer wieder kontrovers diskutiert; die mit dem vorliegenden Buch realisierte Lösung erscheint der Sache dienlich.

Am Beispiel des Kapitels 6 „Fossile Energie“ (S. 277 - 316) wird deutlich, dass die Autoren bei der Besprechung einzelner Rohstoffe durchaus inhaltliche Schwerpunkte setzen. So überschreiten die Ausführungen zu Erdöl und Erdgas die Abhandlungen über die Kohle um rund das Vierfache, obwohl (oder weil?) dieser Energierohstoff über eine deutlich größere Reichweite verfügt. Auch in diesem Kapitel werden sehr kompakte Informationen zu allen wesentlichen Aspekten des jeweiligen Rohstoffes angeboten. Von der Bildung über die Förderung mit ihren Risiken inklusive der unkonventionellen Lagerstätten bis hin zu Methanhydraten und einem Exkurs zu „peak oil“ werden sowohl ein thematischer Einstieg als auch die aktuelle Faktenlage in konziser Weise vereint.

Einige Tabellen, insbesondere aber eine Vielzahl von qualitativ hochwertigen Abbildungen begleiten den Text und visualisieren wesentliche Inhalte. Gemäß dem Konzept des Buches stehen Bilder von Schaustücken aus mineralogischen Sammlungen neben Geländebefunden, Karten, Schemazeichnungen und Diagrammen. Diese Mischung von textlicher Erarbeitung und umfassender Visualisierung erleichtert das Verständnis in vielen Fällen ungemein und wird besonders Fachfremden eine wertvolle Unterstützung sein, doch dürften auch fachlich dem Thema Näherstehende sich an vielen Abbildungen erfreuen.

Ebenfalls sehr hilfreich ist ein weiteres Merkmal, das zunehmend den Weg auch in Fachbücher findet: Mit farbig hinterlegten und damit vom Fließtext abgesetzten Kästen wird ergänzendes Hintergrundwissen eingeschaltet. Die genau 100 Zusätze reichen von wenigen Zeilen wie 2.2 „Superlegierungen“ (S. 53) bis zu Ausführungen, die sich über mehrere Seiten erstrecken, z. B. 6.6 „Zusammensetzung von Erdöl“ inkl. Strukturformeln ausgewählter organischer Verbindungen in Rohöl und Erdgas (S. 291 f), oder 3.3 „Schmelzdiagramme“ mit vier eingeschlossenen, exemplarischen Abbildungen (S. 85 ff).

Zusätzlich noch farbig hervorgehoben werden kurze Erklärungen und Definitionen, z. B. zum Erzgrad (S. 3), zur Metasomatose (S. 191) oder zur Unterscheidung zwischen paralischen und limnischen Lagerstättenbildungen (S. 281). Nun mag man den Standpunkt vertreten, dass Wichtiges in den Text gehöre, Unwichtiges aber unerwähnt bleiben möge. Eingedenk des dem Buch unterlegten Konzepts erscheint dieses aufgeteilte Angebot der Informationen mit eingeschalteten, unabhängigen Texten, dass dem Lesenden Freiheitsgrade bei der Erschließung zubilligt, sehr angemessen.

Am Ende bieten ein mit acht Seiten recht

Literatur:
Neukirchen, Florian; Ries, Gunnar (2016): Die Welt der Rohstoffe. Lagerstätten, Förderung und wirtschaftliche Aspekte.; 2. Auflage; Verlag Springer; Berlin Heidelberg.

ISBN: 978-3-662-48241-4

umfangreiches Glossar (S. 333 - 340), eine etwas grobe geologische Zeittafel und das Periodensystem der Elemente weitere Informationen und Hilfen an.

Will man abschließend zu einer Einordnung des vorliegenden Buches gelangen, so würde es der Verfasser eher nicht als Lehrbuch bewerten. Ein durchweg hohes fachwissenschaftliches Niveau wird nicht aufgegeben, auch weil die Literaturverzeichnisse bei Bedarf eine weitergehende Befassung unterstützen. Die ganze Konzeption und Umsetzung spricht jedoch eher für ein Nachschlagewerk. Einzelne Kapitel können bei entsprechender Interessenlage sehr gut unabhängig von den anderen Inhalten gelesen werden und bieten fachlich Vorgebildeten wie interessierten Fachfremden eine breite Palette an Informationen und Anknüpfungspunkten für ergänzende Recherchen. Mit dem Label „Populärwissenschaftliches Sachbuch“ hat der Rezensent Probleme. Werden als Merkmale der Populärwissenschaftlichkeit unter anderem der weitgehende Verzicht auf die Benutzung von Fachwörtern oder ein eher journalistischer Schreibstil genannt, so trifft das vorliegende Werk diese Kriterien bestimmt nicht. Vielmehr haben die Verfasser ein instruktives Sachbuch vorgelegt. Es ist sicherlich geeignet, einem breiteren Publikum viel Wissen über Grundlagen, Anwendungen und auch Problematiken überwiegend mineralischer Rohstoffe zu vermitteln. Voraussetzung ist allerdings ein hohes Maß an Interesse an den Inhalten, und eben nach Möglichkeit eine geowissenschaftliche Vorbildung. Ansonsten werden die vielen „-ite“ vermutlich schnell fad. Wer diese Voraussetzungen mitbringt, wird, fachfremd oder nicht, einigen Gewinn aus der Lektüre ziehen können.

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Evolution der Erde

Oschmann, Wolfgang (2016)

Rezension

Das Buch „Evolution der Erde“ von Wolfgang Oschmann, veröffentlicht im Haupt Verlag (utb) als Erstauflage im Jahr 2016, ist ein Lehrbuch für Studierende der Fächer Geowissenschaften, Geographie und Biologie. Die Publikation umfasst einerseits die Entwicklung der Erde an sich, mit ihrer Entstehung und Plattentektonik, andererseits die Evolution der auf der Erde lebenden Organismen – Prozesse, die Geowissenschaftler schon seit mehr als 200 Jahren beschäftigen (S. 9).

Das Buch „Evolution der Erde“ möchte einen Überblick über die wesentlichen Prozesse der Erdgeschichte geben (S. 9) und beginnt mit einer Einführung in die Geowissenschaften. Ausgehend von den antiken Philosophen werden die Geschichte der Geo- und Naturwissenschaften kurz angerissen und darauf aufbauend stratigraphische Methoden und die Bedeutung von Gesteinen als Archive der Erdgeschichte vorgestellt. Im zweiten Kapitel fasst der Autor den derzeitigen Wissensstand über die Entstehung des Kosmos zusammen. Dabei geht er sowohl auf die Entwicklung von Galaxien als auch auf die Entwicklung unseres Sonnensystems ein, die auch die Bildung unserer Erde umfasst. Ihre eigentliche „Evolution“ wird in den nachfolgenden Kapiteln chronologisch erzählt. Diese sind in die Erdzeitalter Präkambrium (Kapitel 3-5: Hadaikum, Archaikum, Proterozoikum) und Phanerozoikum (Kapitel 6-16) unterteilt. Letzteres ist in die geologischen Ären Paläozoikum (Kapitel 6-11), Mesozoikum (Kapitel 12-14) und Känozoikum (Kapitel 15-16) gegliedert. Das Paläozoikum ist wiederum in die Perioden – und Kapitel – Kambrium, Ordovizium, Silur, Devon, Karbon und Perm unterteilt, das Mesozoikum in Trias, Jura, Kreide und das Känozoikum in Tertiär und Quartär.

Das Präkambrium beginnt mit Prozessen, welche auf die Entstehung der Protoerde folgen. Beispielsweise die Theorien über die Entstehung des Mondes, die Bildung einer Kruste sowie die Entstehung der Plattentektonik. Dabei geht Oschmann ausführlich auf die Sauerstoffrevolution (great oxidation event), das Klima und die Entstehung des Lebens auf der Erde ein. Informationsboxen liefern in diesem Kapitel vertiefende Informationen, z. B. über den Kohlenstoffkreislauf oder über eine der ältesten Gesteinsabfolgen, die im Greenstone Belt auftritt.

In den darauffolgenden Kapiteln, die das Phanerozoikum behandeln, ist jedes Kapitel gleich aufgebaut in die Unterkapitel „Paläogeographie und Geotektonik“, „Klima, Meeresspiegelschwankungen und Atmosphäre“, „Ablagerungsbereiche“ und „Entwicklung der Organismen“. Das Unterkapitel „Entwicklung der Organismen“ ist wiederum gemäß der Taxonomie der Organismen unterteilt. In einigen Fällen weicht Oschmann von dieser Ordnung ab; beispielsweise ist erst ab dem Devon ein Unterkapitel über das „Leben auf dem Festland“ enthalten, da das Festland erst im Silur besiedelt wurde. Je nach Zeitalter wird auch das zusätzliche Unterkapitel „Massenaussterben“ aufgeführt, worin jeweils die unterschiedlichen Theorien für die Ursachen des Massenaussterbens im jeweiligen Zeitalter erläutert werden. Zudem wird der Fokus immer wieder auf wichtige Schritte in der Entwicklung der Biosphäre gelegt, wie die Kambrische Explosion im sechsten Kapitel, das GOBE (great ordovician biodiversification event) im siebten Kapitel und die Besiedlung

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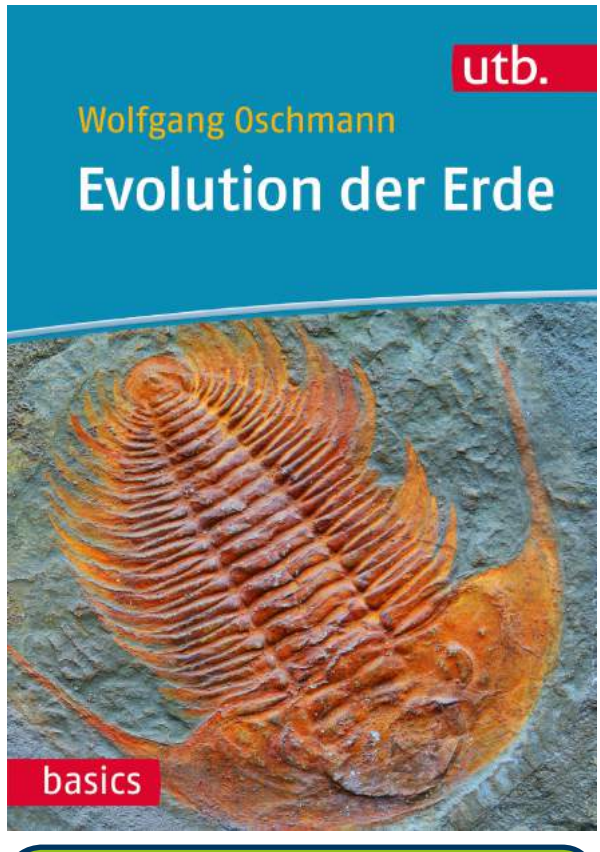
des Festlandes im achten Kapitel. Die Erläuterungen zu den berühmten Fossillagerstätten des Burgess Shale und der Chengjiang-Fauna im sechsten Kapitel zeigen dem Leser auf, woher die Informationen über die Entwicklung der Biosphäre stammen.

Das letzte Kapitel des Buchs bietet einen Ausblick in die Zukunft der Erde. Oschmann geht dabei insbesondere auf Klima- sowie auf plattentektonische Entwicklungen ein. Nicht außer Acht lässt der Autor den Eingriff des Menschen in die Natur und seine Auswirkungen auf die Erde.

Alles in allem gibt es viele positive Punkte zu nennen, die dem Leser die Lektüre einfach machen. Zu allererst unterstützt die ähnliche Gliederung der Kapitel, die Erdzeitalter miteinander vergleichen zu können und einzelne Sachverhalte und Entwicklungen gezielt nachschlagen zu können. Dass Oschmann für seine Buchgliederung nach Erdzeitaltern den Begriff Tertiär gebraucht anstatt der Untergliederung des Tertiärs in Paläogen und Neogen, könnte als Kritik angeführt werden. Möglicherweise lässt sich dieses Vorgehen mit der Gebräuchlichkeit des Begriffs begründen, obwohl nach dem aktuellen Stand der Wissenschaft von Paläogen und Neogen zu sprechen ist. Der Autor findet einen Kompromiss, indem er das Kapitel nach der alten Konvention benennt und innerhalb des Kapitels sehr wohl die beiden Entwicklungsphasen unterscheidet. Die Übersichtlichkeit leidet dadurch jedoch nicht. Sie wird durch viele weitere Elemente forciert, z. B. durch die kurze Einführung über das jeweilige Erdzeitalter, die sich am Anfang jedes Kapitels befindet: Zum einen gibt ein kurzer Text eine Übersicht über das Erdzeitalter, und ein stratigraphisches Diagramm macht wichtige Entwicklungen der Periode auf einen Blick erfassbar.

Eine schnelle Orientierung in der Geschichte der Erde und eine leichte Handhabbarkeit fördern die Übersichten auf den Umschlagsinnenseiten. Zum einen findet sich dort eine Darstellung der Entwicklung der terrestrischen Biosphäre projiziert auf ein Jahr und eine stratigrafische Tabelle mit der Einteilung der Erdgeschichte in die einzelnen Erdzeitalter.

Dass sich nach den Präkambrium-Kapiteln und jedem Äon weiterführende Literatur findet, macht das Buch für Studierende zu einer wertvollen ersten Anlaufstelle für Fragen, die die Erdgeschichte betreffen. Zum Nachschlagen ist das vier Seiten umfassende Register ebenso hilfreich wie das dreiseitige Glossar, welches wichtigste – insbesondere geologische – Begriffe erklärt. Allerdings könnte Letzteres durchaus etwas länger ausfallen, da auch interessierten Laien geologische oder paläobiologische Begriffe noch nicht vertraut sein könnten. Beispielsweise werden die unterschiedlichen Merkmale von Archaeo- und Caenogastropoden im Text und im Glossar nicht genauer erläutert. Der Autor setzt also



Literatur:
Oschmann, Wolfgang (2016): Evolution der Erde.; Verlag Utb; Stuttgart.

ISBN: 978-3-82524-401-9

ein gewisses Maß an Vorwissen voraus.

Da die „Evolution der Erde“ verschiedene Aspekte der Erdentwicklung betrachtet (Klima, Biosphäre, Geosphäre), könnte das einfache Durchlesen des Buchs eine Herausforderung bedeuten. Hier hilft dem Leser auch die Einteilung in Unterkapitel, die für ihn relevanten Inhalte zu filtern.

Inhaltlich geht das Buch weit über die Beschreibung der Entwicklungen auf der Erde hinaus. So gliedert Oschmann die Eiszeiten nicht nur in Warm- und Kaltzeiten (Kapitel 16), sondern erklärt auch die Mechanismen, die diese Klimaphasen verursachen (z. B. Milankovitch-Zyklen).

Die abstrakten Inhalte des Buches werden durch viele Illustrationen unterstützt. Beispielsweise geben die Abbildungen einen Überblick über die Konstellation der Kontinente zu den verschiedenen Erdzeitaltern. Außerdem illustrieren sie die Morphologie der Organismen. Eine kleine Verbesserung wäre lediglich, den Maßstab im Bild und nicht in der Abbildungsunterschrift darzustellen. So wäre die Größe der Lebewesen leichter nachvollziehbar.

Das Buch „Evolution der Erde“ bietet eine übersichtliche Gliederung und Beschreibung der Evolution der Erde. Besonders gelungen ist die Synthese, die Oschmann zwischen den einzelnen Teildisziplinen Geologie, Mineralogie, Paläoklimatologie, Geophysik und -chemie und die Entwicklung der biotischen Umwelt findet. Auf diese Weise gelingt dem Autor eine multiperspektivische Zeitreise in die Erdgeschichte, die er in verständlichen Worten darstellt. Daher kann zusammenfassend gesagt werden, dass das Buch eine empfehlenswerte Lektüre für Studierende der Geowissenschaften ist, welches sich sowohl zum Nacharbeiten des Lehrstoffs als auch zur Vertiefung eignet.

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VOM PARKETT IN DIE LOGE

Ob im Kino, Theater oder Stadion, die Loge ermöglicht durch ihre Lage eine besondere Perspektive auf das Geschehen zu nehmen und so die Dinge besser beobachten zu können – vorausgesetzt, man verfügt über das entsprechende Ticket. Genauso soll auch die geographische Open-Access-Zeitschrift geo Loge dazu beitragen, eine besondere, wissenschaftlich-analytische Perspektive auf das fachliche Geschehen zu erlangen. Studierende bekommen die Möglichkeit, bereits während des Studiums aus der „Parkett-Perspektive“ heraus und in die Loge einzutreten. Die Eintrittskarte hierzu erhalten Sie durch das Verfassen wissenschaftlicher Beiträge.

Eure Redaktion

Impressum

Verantwortlich:
Redaktion der geo Loge
Geographisches Institut
Ruhr-Universität Bochum
Universitätsstraße 150
44780 Bochum

Redaktion:
Ann-Michelle Hartwig
René Hohmann (B.Sc.)
Patrick Matuszewski
Mike Schäfer (B.Sc.)
Bianca Skowron (B.Sc.)
Lena Tillmann (B.Sc.)

Layout:
Lena Tillmann (B.Sc.) und René Hohmann (B.Sc.)
Titelbild:
Bianca Skowron (Bearbeitung durch René Hohmann)
Herausgeberin:
Stephanie Bednarz, (M.Sc.)
Wissenschaftlicher Beirat:
Thomas Nader, Dipl.-Geograph
Dr. Andreas Rienow, M.A. Geographie
Tobias Scholz, M.Sc. Geographie
ISSN: 2191-3900

Die geo Loge erscheint am Geographischen Institut der Ruhr-Universität Bochum und ist im Internet über **http://GeoLoge.Geographie.RUB.de** abrufbar.