Identifying which human aspects play a crucial role in land consolidation processes

Walter Timo DE VRIES, Germany

Key words: land consolidation, land management, values, belief systems, human geodesy

SUMMARY

This paper introduces and analyses how which human aspects play a role in land consolidation processes. The analysis is based on a selected set of recent research results on land consolidation practices, on the basis of which - in an exploratory way - a set of fundamental human aspects are derived, which together may constitute a (human geodetic) framework. These aspects include: human identity, human values, human sentiments, human recognition, human dignity, human variation, human relations, and human choices. All of these aspects are interrelated, but understanding, measuring and interpreting each of these is relevant for specific parts of land consolidation (and other division, allocation and re-distribution) processes and collecting data for each requires different techniques and methods. Further conceptual and empirical development is recommended to understand better how these aspect influence the processes, institutional acceptance and the outcomes of land consolidation.

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1. INTRODUCTION

Geodetic engineers consider land consolidation a key task of geodetic engineers. Land consolidation is a kind of land intervention, which requires both a thorough understand of how to measure and demarcate land, and an understanding of how to allocate or exchange ownership of land. The former necessitates both specific mathematical and information technical skills, which are typical for an engineer and prototypical for a geodetic engineer. The latter requires a thorough understanding of legal and organisational issues related to land rights, land ownership and procedural aspects.

The conventional association of the scope and utilization of land consolidation is with agricultural economics and rural development. FAO (2003) refer to land consolidation as a tool which can assist farmers to amalgamate their fragmented parcels. For example, a farmer who owns one hectare divided into five parcels may benefit from a consolidation scheme which results in a single parcel. In many eastern European (FAO, 2004, Hartvigsen, 2014) land consolidation programs tend to have primarily such an economic and/or and rural development focus (Bullard, 2007). More recently land consolidation is associated specifically to a societal benefit or public value, such as food security (Bennett et al., 2015, Ntihinyurwa et al., 2019) or environmental protection (Abubakari et al., 2016, Louwsma et al., 2014). Not the micro-economic agricultural production values count in these cases, but the public values at a larger – often national or regional - scale. The optimal output of a land consolidation process then needs to be evaluated in terms of this societal benefit, rather than a pure economic benefit.

Method-wise, Louwsma and Lemmen (2015) introduce land consolidation as an instrument to counteract land fragmentation and the associated negative impact on the productivity and costs of farming. The most common interpretation of land fragmentation relates to physical aspects of fragmentation, i.e. holdings with a large number of small parcels scattered over a considerable area (Ntihinyurwa et al., 2019). Savoiu et al. (2015) indicate that different types of land consolidation exist which each require different methodologies of implementation and different indicators of optimization. Vitikainen (2004) specifies such indicators of land consolidation: defragmentation of parcel size and location (improvement of agricultural and/or forest land division, re-allotment of leasehold areas, enlargement of farm size), reconstruction of urban areas (land use planning in village areas, readjustment of building land), creation of accessibility to roads and utilities (improvement of road network, drainage network), environmental protection and planning (implementation of environment and nature conservation areas), spatial and regional development (promotion of regional development).

Demetriou et al. (2013) further specify procedures and decision support systems to quantify the resultant optimization parcel sizes.

In the world of praxis land consolidation often relies on having inter-personal, social and communication skills. These skills are often only taught and learned after graduating from geodetic or surveying engineering study programs. Nonetheless these skills and knowledge are apparently considered crucial for geodetic engineers. After all, the original meaning of geodesy is shaped by two Greek words, γεωδαισία or geodaisia, literally meaning the "division of the Earth". So, the original meaning of geodesy deals with activity of dividing rather than the static status quo of division, although by most geodesy is primarily associated with measurements of the earth's shape, the boundaries between parcels and zones and the gravitational field. de Vries (2017) argues that constituting, defining and framing a new scientific field called 'human geodesy' is necessary and relevant given the transdisciplinary and human nature of dividing the earth. Hence there is a strong need to understand and conceptualise what these skills mean in the geodetic field. This article describes and classifies what these human aspects are, and how and why they are relevant parts of the geodetic profession. To underline this relevance it derives a theoretical framework for what will be called human geodesy.

This paper first provides short synopses of three research experiences. These experiences in land consolidation are described at different scales. Each of these specifically focused on the practices of land consolidation rather than the regulatory and technical aspects of land consolidation. The first research deals with land consolidation practices in different parts of Bavaria, Germany. The second was a comparative study between Bavaria and the Republic of Macedonia. The third concerned a European-wide comparison on land consolidation practices. The following section discusses, highlights and classifies a number of aspects which can be considered related to people, their views and their behaviour. From these a a set of principles are derived which will be referred to as human geodetic operational principles. The concluding section provide a general synopsis and a number of recommendations for further research.

2. RESEARCH EXPERIENCES IN LAND CONSOLIDATION FROM A GEODETIC PROFESSIONAL PERSPECTIVE

2.1 Land consolidation in Bavaria

The study of Guggemos (2018) aims at comparing the theory (i.e. the prescribed act and regulations) with the practical implementation of land consolidation in Bavaria. Guggemos (2018) compares different aspects of the land consolidation practices in different parts of Bavaria, Germany. The institutional arrangement in Bavaria is that there is a land consolidation act which applies for the entire Bavaria, but in each region the rural development agencies can make their own decisions on how and where to conduct a land consolidation project. The study reveals that although there are only minor deviations between the law and the practice, not because of a major infringement or deviation from the law, but as a way to align discretionary space which the law provides to the existing situation on the ground. It was found that the biggest differences between theory and practice were connected

to the communication with stakeholders and the public. In Bavaria, as part of the implementation of a land consolidation project, significantly more is involved and communicated than is formally required by law - ranging from the early involvement of the authorities to additional meetings, working groups, corridor workshops and on-site inspections, to a two-day meeting organized by the school of village and rural development. Often the communication is most successful if local dialects are used.

The increased attention for the human aspect of communication complements a major shift in focus land consolidation projects in Bavaria. Projects which solely focus on agricultural improvement are steadily declining, whilst improving nature, environment and flood protection is increasingly coming to the forefront. In these domains both the number and variety of insights and priorities of stakeholders is much larger than the pure agricultural economic interests. Hence, the ability to speak at different registers and understand the epistemic language of different domains is crucial.

In addition, priority is currently being given to speedy procedures of land consolidation. Given that historically land consolidation projects could take more than 20 to 30 years to complete, currently the simplified land consolidation procedure and/or the voluntary land exchanges are preferred over the large-scale land consolidation projects. In such smaller projects it is easier to communicate as a group of stakeholders, as one can know each other and each other's priorities quite rapidly.

2.2 Comparative study Bavaria vs Republic of Macedonia

In order to evaluate to which extent and how context plays in conducting land consolidation projects in 2018 a study was made comparing land consolidation practices in Bavaria with those in Republic Macedonia (de Vries et al., 2018). The study aims at comparing two cases with significantly different histories and policy settings: Land consolidation in the free State of Bavaria in Germany, where land consolidation has been a practice for over 100 years, even though its usage is gradually declining; and, land consolidation in Republic Macedonia, where the land consolidation law has been recently re-designed, and where land consolidation is a relatively new tool in the land management practice. The comparison entails institutional and legal frameworks, practices in relation to start, execution and completion of land consolidation projects. Data were compared through extensive document analysis, expert interviews and site visits of land consolidation projects in both Bavaria and Republic Macedonia.

The comparison reveals that many operational practices of land consolidation are highly dependent on local historical decisions, which cannot be easily adapted. Land consolidation legislation has regularly changed in both Bavaria and Republic Macedonia, even though the current Bavarian legislation seems relatively stable. Still, adaption has taken place, for example to accommodate other interests than agricultural ones, including rural development objectives at large and environmental concerns in particular. Also, the organisational structures through which land consolidation is to be carried out has changed over time. Where originally the rural development agency took a leading role, currently much more authority has been transferred to the local land consolidation committees. The main reason and justification to adopt these gradual changes was to handle different kinds of uncertainties: process uncertainty arising from

possible resistance of stakeholders who might obstruct the process by prioritizing individual benefits over common benefits.

Although in both Bavaria and Republic Macedonia land surveyors and geodesists (potentially) play an active role in land consolidation processes, their role and institutional embedding is completely different. In Bayern land surveyors are employed by the agency for rural development and are tasked to help co-design the land re-allocation plan and stake out new boundaries. It is even so that land surveying and/or geodesy education are pre-requirements for a position at the rural development agency. In Republic Macedonia the Ministry for Agriculture, Forestry and Water Economy, department for land consolidation, does not employ land surveyors or geodesist. Instead they rely on agricultural specialists for most of the land consolidation tasks and decisions. In general the geodesists are employed by private firms, who carry out certain tasks which are subcontracted by the Ministry. One of the anticipated tasks for land surveying firms includes the conduct of pre-land consolidation feasibility studies, a tasks for which they are not principally educated. As a result, they need to be upgraded by the MAINLAND project in order to be able to conduct such a task.

Coercing participants to join and/or participate land consolidation projects to achieve public objectives is possible in Bavaria, yet highly contested in Republic Macedonia. There is still a significant difference between Bavaria and Republic Macedonia in the manner in which coercion, enforcement and sanctioning can take place in case of non-participation or non-compliance to land consolidation projects and re-allotment plans. A vital role exists in Bavaria for the committee of stakeholders who ultimately decide, whereas in Republic Macedonia the final decision for start of land consolidation project is rooted in the Ministry. This might hamper the sense of ownership related to the decision, but at the same time this may also reflect a fundamental difference in how to ensure compliance.

The degree to which the rural development agencies in Bavaria are accepted and respected by local stakeholders is high. This is however not a given and a characteristic which is automatically achieved simply by the legislation itself. Many agencies have active press and/or marketing officers and staff member whose primary task it is to explain the role and functions of the agency. The MAINLAND project in Republic Macedonia is also taking this extension and awareness raising function seriously in order to raise legitimacy. Hence, in both Bavaria and Macedonia legitimacy is a crucial issue. Both countries justify this by stating that land consolidation may often be contested by local farmers. It is therefore vital to speak at eyesight and frequently explain and discuss the pros and cons of land consolidation with local stakeholders in order to ensure legitimacy.

2.3 European-wide study on land consolidation practices

The 2019 study of de Vries et al. (2019) compares land consolidation practices for 20 countries. Similar to the studies of Guggemos (2018) and de Vries et al. (2018) the main focus of the study was on revealing the practice of land consolidation. In this study the practice is derived from an analysis of the experiences of senior professional land consolidators, captured through so-called narrative vignettes, i.e. short personal stories of experiences, opinions and perceptions. The study concludes that despite regional differences

in preferences, attitudes and opinions about whether land consolidation is an appropriate instrument, there seems to be some consensus that land consolidation projects should currently be highly pragmatically oriented, whereby one has to be very sensitive to the needs and characteristics of local contexts and stakes, and whereby one needs to be very clear on both short-term and long-term wins.

A crucial conclusion form a human perspective in this study is that becoming a practical land consolidator requires a steep learning curve, which is heavily reliant on personal and long-term experience. Knowledge, skills and experience go hand-in-hand for land consolidators. Land consolidation requires specific human skills: a high ability to compromise, the ability to communicate with responsible persons, a deep interest in all people living and working in the area, the ability to deal with people, being able to motivate and inspire stakeholders, having a personality which is never discouraged from setbacks and which is open for new challenges and have a personal vision.

3. CLASSIFYING THE HUMAN ASPECTS

All three research experiences indicate that human and social aspects are crucial in land consolidation and that professional land consolidators need to be able to understand and work with these. Hence, it is important to understand which human aspects play a role, and how one can detect, capture and analyse these on the one hand, and apply the insights as geodetic engineers on the other hand. The different human aspects are discussed hereunder.

3.1 Human identity

The experience form land consolidation projects indicate that changing relations to land are often taken personally. There is a strong sense of land tenants that the land relates to a sense of history, heritage, home, and family. One could capture this strongly felt relation as human identity. People identify with the place where they grew up, where they made their first experiences and relations, and where they heard the stories from their past from their elders and ancestors. Human identity is very location specific, and as a result it plays a strong role in the division of land and how people would allocate land if they were amongst their peers in identity. Golubović (2011) describes human identity as '*where one (a person or a group) belongs, and what is expressed as "self-image" or/and "common-image", what integrate them inside self or a group existence, and what differentiate them vis-à-vis "others"'.* The concept itself has various dimensions, yet it is not a neutral concept. It varies along with people and with space, and as a consequence, it plays a role in the division of space. It also has a close connection to cultural heritage to both social and physical (landscape) preferences (Krupowicz et al., 2019).

Human identity is the human geodetic equivalent of gravity in physical geodesy. Similar to gravity is it omnipresent and it softens gradually with distance. At the same time there are also micro differences which can be very influential for local outcomes. Yet, how does one capture human identity as a geodesist? It has to be done using methods which are directly related to how individuals, who have a stake in land division matters, identify with the land and also take decisions in the process of individuation, i.e. the degree to which individuals or groups of individuals can be differentiated from each other. Here one can make use of interactive

methods of data collection, i.e. through interviews, focus groups, interactive ranking methods. In addition one can make use of observational methods and seek patterns in how individuals speak, behave, react, use metaphors and symbols and refer consistently to places of value and significance.

3.2 Human values

Closely related to identity but different in both data collection and analysis is the aspect of human values, or perhaps better the collection of normative values, beliefs and views. In land consolidation processes it became obvious that stakeholders do not just have different views and opinions on how the processes of re-distribution should be carried out and which preferences for certain outcomes existed, but that these views and opinions were rooted in more or less coherent belief systems, i.e. normative frameworks of what is considered good or bad, right or wrong. In these normative frameworks one can differentiate two types: Professional (epistemological) views and beliefs and personal views and beliefs. Professional epistemological aspects and values reflect the commonly accepted professional views and experiences, connections and professional networks, educational backgrounds and professional ambitions, whereas personal views and beliefs are much more connected to life experience epistemologies and values. Personal values reflect perceptions on reality, senses and associated behaviour generated through events, constraints and successes in life, learning experiences, natural resistance to change (location, type of living), personal visions, personal ambitions, localised interests and world views created out of localised perceptions.

This wide spectrum human values is the human geodetic equivalent of spectral values when observing land through digital images. The way to collect such values is for example by systematically comparing preferences and rankings of opinions on certain statements and propositions, and then distilling comprehensive belief and values systems. Q methodology, accompanied by principle component analysis and/or factor analysis may be appropriate for such data collections and analysis (Chandran et al., 2015, de Vries, 2018). These are indeed elaborate processes which require a combination of both quantitative and qualitative methods

3.3 Human sentiments

In the process of land consolidation many land consolidators expressed that they had to deal with human sentiments. There are many of those, and many of the sentiments are time and location specific, yet all of these influence the manner in which people are behaving and reacting during a consolidation or re-allocation process. Human sentiments which may emerge during such processes include happiness, consent, comfort, frustration, anger, amongst others. Benson (2016) describes the aspect of anger using the anger iceberg metaphor, displaying that anger is just the tip of an iceberg connected to other types of emotions, such as grief, embarrassment, anguish, annoyance, disappointment, rejection, stress, anxiety, worry, envy, insecurity, hurt, depression, guilt, regret, disrespect, annoyance. The metaphor of the anger iceberg is a good way to show that many sentiments are multidimensional and are connected to multiple aspects of anger. As indicated in the land consolidation practices, one needs to be able to collaborate with different stakeholders who may not always be happy and who may express their emotions in all sorts of ways.

For a human geodesist there are two questions to be dealt with: first, how does one recognize the (multi-dimensional) sentiments and secondly how does one deal with for example resistant or angry citizens which may obstruct the process of execution? Regarding the first question, experienced practitioners say it is important to listen and observe carefully. Physically expressed sentiments (loud voice, anger face, flared nostrils in case of anger) are obvious but are often short-lived, but the more subtle and low intensity emotions and micro-expressions (visible through ironic nods, neutral faces, repeating the same question over and over) may be more significant in dealing with people in a long-term trajectory. For the second question there are various guides and recommendations –also from mediation and customer behaviour literature. In short one should: remain calm, do not take all reactions personally, being patient, use listening skills, sympathize with the anger instead of arguing back, and apologize in the right way if necessary or appropriate and let the stakeholder derive his or her own solution. Handling human sentiments is the human geodetic equivalent of adjustment in mathematic geodesy. Adjusting the sentiments within the boundaries of the legal, social and operational context is the key purpose of human geodesists.

3.4 Human recognition

A core overarching concept which may be most relevant for human geodetic conceptualisation is the concept of recognition. The word 'recognition' itself has both a passive and active meaning: One the one hand it refers to recognizing as a practitioner which sentiments exists as well as the sentiment of feeling recognized, heard, appreciated. Whilst equality is an often used normative term referring to the equal distribution of land portions, family and social relations tend to be a main factor why the physical divisions are often not so equal in size. One of the key social relations affecting choices of division of land is the man-woman relation. In many societies decisions on land are mostly taken by men, and usually men tend to have more de facto rights on land than women (despite having dual registration of both men and women). Recognition of women, or the lack thereof, can be explain the reasons why equal distribution is often not reached. Castleman (2013) defines recognition as "the extent to which an individual is acknowledged by others to be of inherent value by virtue of being a fellow human being." This acknowledgement is crucial when evaluating the extent to which women are 'heard' and included in socially constructed decisions, including the issue of what to do with land and how to divide land.

Measurement and analysis of recognition is not obvious. The logic of recognition is similar to the projection and transformation logic in mathematical geodesy. One has to understand and recognize a particular issue, subject or object using a different perspective than the plain description of the issue, subject or object itself. Recognition is transactionary. One has to recognize that another person exists with an equal right to exist despite possibly having different ideas, values, beliefs, priorities and viewpoints.

3.5 Human choices

Human choices can be either rational, bounded-rational, discretionary or random. In land consolidation processes one often expects rational choices, usually related to argumentations that a re-distribution leads to better shaped parcels and allow for more agricultural efficiency and optimized economic benefits. Appealing to those rational arguments is the most fundamental reason for rational choices. In practice, however, people do not always opt for the most rational choice, either because they rely on another type of argumentation, or they rely on other sources of information, or they have a fundamental non-rational objection to the suggested solution. In these cases the choice may be either bounded-rational (usually if information is disputed or not available) or random. Discretionary choices emerge if there is a certain room of freedom of options to choose from. de Vries and Zevenbergen (2011) argue that discretionary decision space emerge because acts and regulations cannot regulate each and every step and condition in varying contexts. There always remains some room to make decisions which are connected to either ad hoc preferences or random choices.

Human choices are the human geodetic equivalent of geodetic coordinates. As nodes and points in an endless space of options they form the meeting grounds of different perspective and insights. They are most visible, detectable and measurable through observing human behaviour and through such as stated choice methods, for example.

3.6 Human relation

People usually do not only take fully individual decisions. They are influenced by the groups in which they live and/or work. Hence, the social environment and the kind of relations that people have influence the outcomes in many land related intervention processes. The kinds of social aspects which are relevant include: group and peer pressure, group influence, group examples, group belonging, group support, inclusion / exclusion, participation, contribution. Land consolidators in the research about practice also indicated that it is important to be recognized by the group of stakeholders one is working with. This requires for example the ability to speak the local dialects and/or languages, having a deep interest in all people living and working in the area, having local connections and affinity with the social networks, and understanding the principle that in local regions communities ‘get by with a little help from my friends’.

Understanding human relations is the human geodetic equivalent to understanding datums and reference systems. People relate to other people through some form of reference. In absolute terms people relate to families, but in more relative terms people can also relate to peers, friends, neighbours, colleagues and (representative) politicians. These relations are crucial to survive and to create influence and agency.

3.7 Human variation

A crucial issue for all geodesists is measuring and assessing certainty and uncertainty of observations and specifying errors and variations in errors. Indeed, humans are full of errors and uncertainties, especially in their behaviour towards formal procedures, towards bureaucracies, towards their peers, etc. Human geodesists should thus be most aware of the

human error, and have the ability to deal with mistakes and errors, to take responsibility in case of unclear, being reflective, and to acknowledge stress or happiness associated with uncertainty. Being reflective and responsible are perhaps the best instruments for dealing with human errors and human variations of standpoints, positions, beliefs. Variations of these occurs especially in the course of time. When land consolidation projects take a long time there may not only be a change on viewpoint of a single person, but the single person may also not be part of the project anymore. In these cases one has to deal with newly arising viewpoints. The geodetic equivalent is obviously the ability and techniques to specify errors, error ellipses and reliability.

3.8 Human dignity

The essential question in human geodesy is: with which justification does one divide? The contemporary discourse is that division of land and resources should be done in a 'responsible manner' (de Vries et al., 2015, de Vries and Chigbu, 2017), should be 'equitable and fair' (Magel and Miosga, 2015) and 'fit-for-purpose' (McLaren et al., 2016). However what do these words mean and which values are beneath these terms? From a human rights perspective, but also reflected in the discourses on how to execute land consolidation effectively, the term and concept 'human dignity' emerges. Human dignity reflects an individual or group's sense of self-respect and self-worth, and it is connected to ideas of sanctity, autonomy, personhood, physical and psychological integrity and empowerment. In simple words, it is crucial in land related projects that one cannot treat everybody in exactly the same way. Each person and each group is different.

Yet, measuring or determining variations in this rather philosophical and ethical aspect of human dignity is not evident. One has to use the proxies of degree of perceived or comparative levels of autonomy, self-respect, worthiness, and self-esteem. Moreover, if there is any indication that certain people or certain regions are treated with lower levels of human dignity than others, than one has to step in. Of course, each person is treated equal according to many constitution, but this does not take away the fact that each person is different and has individual views and opinions, has their own family and friends, and is always living in unique circumstances. For land consolidators this aspect is relevant. One needs to take every project as a separate task. One cannot copy simply from previous projects how to deal with people or what to assume stakeholders will want.

This distinctive feature related to the human dignity aspect can one perhaps best compare with quality norms and assessments in surveying. These are also rather normative and to a certain degree subjective. There are indeed variations in acceptable quality, but one should always strive for a minimal degree of quality before one accepts the measurement.

4. DISCUSSION

Figure 1 summarizes the eight fundamental human aspects from the land consolidation experiences. I will refer to these aspects as fundamental human geodetic aspects. Many of

these concepts are inter-related, but each concept offers a specific comprehension of human activities and/or humanly driven causes and effects.

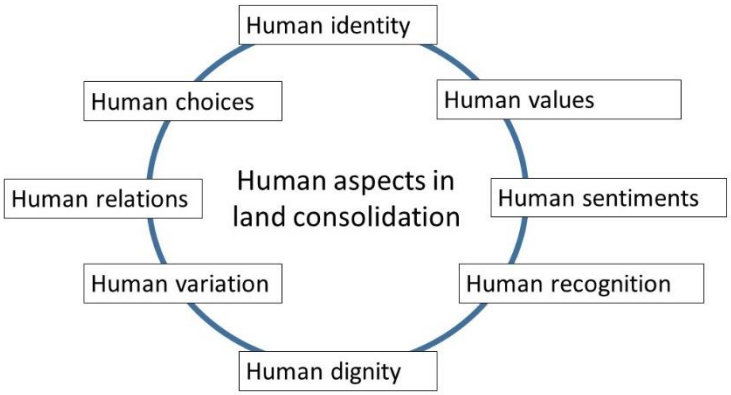

Figure 1. Human aspects in land consolidation

Having identified and specified the fundamental human aspects of land consolidation as part of a broader scientific notion of human geodesy, the next step is to review how these aspects are inter-related, and what kind of main principles can be posited such that the fundaments of human geodesy are demarcated. This can be done using a number of dichotomous questions, which can be connected to each of the aspects, and which can derive a number of operational guidelines on when and how to include human geodetic aspects in land consolidation projects.

4.1 Location specific or non-location specific insights

To a large extent human identity, human relations and human choices are predominantly location-specific, because they all relate to a specific feeling, belief of behavior which can be connected to a certain area on the ground. Often this is translated in the name of the community with which one identifies, a local dialect, or an historical string of family relations. On top of that local choices may be strongly determined by geomorphology and/or topography. In contrast, human variation and human dignity are far less location specific because these could apply to any location. Human dignity is for example used to state that respect and appreciation should apply anywhere, and should be treated equally in all areas. Finally, human sentiments are often location specific, as they have to deal with specific reactions to plans or types of communication, but at the same time this aspect is very person dependent. There are simply people who express their sentiments more or less regardless of the location of the context, despite the fact that cultural theories would also make a difference between origins.

4.2 Long term versus short term insights

Another difference is related to the duration of particular aspects. Human identity and human values are for example long-lived, whereas human sentiments are much shorter lived. The implication of these difference is that measuring and accounting for each aspect has to be done at different time scales.

4.3 Land consolidation processes-related or non-process related aspects

Each land consolidation process, big or small, guided or voluntary, urban or rural, has a number of process steps. Hartvigsen (2015) specifies the following generic process steps as: pre study, initiative submitted to a government agency, initial public meeting, re-allotment planning, project approval, preparation of registration, execution of re-allotment and registration. Some of the aspects play a different role in each of these generic process steps. The aspect of human identity needs to be captured in the pre-study and is required in the re-allotment planning. The goal is to conserve the identity and cultural heritage and not to delete it through the land consolidation. The aspects of human recognition is for example especially crucial during the public meetings. All people need to be heard and equally taken seriously. Human values are especially crucial in the project approval stage, because it is at this stage that values which are intrinsic in the new plan and which are explicit in the legislation are institutionalized.

4.4 Automatic feature extraction and use of big data versus specific data for each project

Some of the human aspects can be captured and/or assembled through feature extraction of big data, including data collected through remote sensing (Wagner and de Vries, 2019, Lee and de Vries, 2020). A synthesis of twitter, facebook or Instagram message could for example evaluate certain human sentiments and derive and/or predict operant value systems. Similarly human relations could be derived from different social network media, such as facebook (for private relations) or Linkedin (for professional networks). In addition, many human values could be captured by online value capturing tools such as Q Methodology (de Vries, 2018) or through automated machine leanring from remote sensing images. Hence, the collection of many human aspects are no longer dependent on specific surveys and direct interviews, but can also be collected through automated means.

5. CONCLUSION

Many of the human aspects in land consolidaiton are already practiced. In that sense one could argue that if land consolidaiotn is a human geodetic activity, human geodesy already exists implicitly, because many practitioners in land consolidation tend to be geodesists who implement projects using all kinds of human related concepts, methods, techniques, epistemologies and axiologies. However, up till now the scientific fundaments of human geodesy are still scattered and undocumented. This paper provides a first overview of which aspects are relevant for human geodetic practitioners, and also addresses how and why these aspects are intrinsically connected to other concepts, tools and techniques of the geodetic

profession and the geodetic science. For each of the aspects there exists a physical, mathematical or engineering geodesy equivalent. This justifies that human geodesy is connected and understandable from a geodetic perspective – rather than from another disciplinary perspective. Given this, the goal of specifying and unravelling these concepts in more detail is to start a more fundamental discussion on the principal paradigms and basic assumptions of human geodesy. Once these are derived, human geodesy can be broadened and widened further with its own identity and a truly recognized part of both geodesy (as an engineering science / discipline) and human sciences. In addition, the description and classification of aspects could be used for further empirical analysis.

6. REFERENCES

ABUBAKARI, Z., VAN DER MOLEN, P., BENNETT, R. & KUUSAANA, E. D. 2016. Land consolidation, customary lands, and Ghana's Northern Savannah Ecological Zone: An evaluation of the possibilities and pitfalls. *Land use policy,* 54**,** 386-398.

BENNETT, R. M., YIMER, F. A. & LEMMEN, C. 2015. Toward Fit-for-Purpose Land Consolidation. *Advances in Responsible Land Administration.* CRC Press.

BENSON, K. 2016. The Anger Iceberg. Available: https://www.gottman.com/blog/the-anger-iceberg/ (last date of access: 6.5.2019).

BULLARD, R. 2007. Land Consolidation and Rural Development. Papers in Land Management. No. 10.

CASTLEMAN, T. 2013. Human recognition and economic development: An introduction and theoretical model.

CHANDRAN, R., HOPPE, R., DE VRIES, W. & GEORGIADOU, Y. 2015. Conflicting policy beliefs and informational complexities in designing a transboundary enforcement monitoring system. *Journal of cleaner production,* 105**,** 447-460.

DE VRIES, W. T. 2017. Human geodesy - shaping a new science and profession for the world of tomorrow. *FIG Working week 2017.* Helsinki, Finland.

DE VRIES, W. T. 2018. Towards a theory of metagovernance of land: fundamentals and prospects. *Journal of land policy and governance (JLPG),* 1**,** 26-36.

DE VRIES, W. T., BENDZKO, T., GJORGJIEV, G. & MALIJANSKA, N. 2018. Comparing land consolidation history and future – case studies Bavaria/Germany and Republic Macedonia. Report for BAYHOST funded project MB-2018-2/12 'Flurbereinigung in Theorie und Praxis - eine Vergleichsstudie Bayern- Mazedonien'. . TU Munich, Chair of Land Management.

DE VRIES, W. T., BENNETT, R. M. & ZEVENBERGEN, J. 2015. Toward Responsible Land Administration. *Advances in Responsible Land Administration.* CRC Press.

DE VRIES, W. T. & CHIGBU, U. E. 2017. Responsible land management - Concept and application in a territorial rural context. *fub. Flächenmanagement und Bodenordnung,* 79**,** 65-73.

DE VRIES, W. T., WOUTERS, R. & KONTTINEN, K. 2019. A comparative analysis of senior expert experiences with land consolidation projects and programs in Europe. *FIG Working week 2019, Geospatial information for a smarter life and environmental resilience.* Hanoi, Vietnam.

DE VRIES, W. T. & ZEVENBERGEN, J. A. 2011. Discretionary space as a concept to review innovation in land administration in Africa. *Survey review,* 43**,** 638-652.

DEMETRIOU, D., SEE, L. & STILLWELL, J. 2013. A parcel shape index for use in land consolidation planning. *Transactions in GIS,* 17**,** 861-882.
FAO 2003. The design of land consolidation pilot projects in Central and Eastern Europe. *In:* FAO (ed.).
FAO 2004. Operations manual for land consolidation pilot projects in Central and Eastern Europe. Rome: Food and agiculture organization of the United Nations (FAO).
GOLUBOVIĆ, Z. 2011. An anthropological conceptualisation of identity. *Synthesis philosophica,* 26**,** 25-43.
GUGGEMOS, A. 2018. *Bayrische Flurneuordnung in Theorie und Praxis.* Bachelor, Technical University of Munich.
HARTVIGSEN, M. 2014. Land reform and land fragmentation in Central and Eastern Europe. *Land Use Policy,* 36**,** 330-341.
HARTVIGSEN, M. B. 2015. *Land Reform and Land Consolidation in Central and Eastern Europe after 1989: Experiences and Perspectives.* Videnbasen for Aalborg UniversitetVBN, Aalborg UniversitetAalborg University, Det Teknisk-Naturvidenskabelige FakultetThe Faculty of Engineering and Science.
KRUPOWICZ, W., CZARNECKA, A. & GRUS, M. 2019. Possibilities of implementing crowdsourcing initiatives in rural development programmes in Poland. *FIG Working Week 2019. Geospatial information for a smarter life and environmental resilience.* Hanoi, Vietnam, April 22–26, 2019.
LEE, C. & DE VRIES, W. T. 2020. Bridging the Semantic Gap between Land Tenure and EO Data: Conceptual and Methodological Underpinnings for a Geospatially Informed Analysis. *Remote Sensing,* 12**,** 255.
LOUWSMA, M. & LEMMEN, C. 2015. Relevance of leased land in land consolidation. *FIG Working week - From wisdom of the ages to the challenges of the modern world.* Sofia, Bulgaria.
LOUWSMA, M., VAN BEEK, M. & HOEVE, B. 2014. A new approach: Participatory Land Consolidation XXV FIG Congress, 16-21 June 2014, Kuala Lumpur, Malaysia. FIG, 2014. .
MAGEL , H. & MIOSGA, M. 2015. Philosophische Grundlagen zur Chancengleichheit. Welcher Begriff von Gerechtigkeit wird dabei zugrunde gelegt? . *3rd session of Enquete-Commission „Gleichwertige Lebensverhältnisse in ganz Bayern“ (27.01.2015).*
MCLAREN, R., ENEMARK, S. & LEMMEN, C. Guiding Principles for Building Fit-For-Purpose Land Administration Systems in Developing Countries: Capacity Development, Change Management and Project Delivery. Recovery from Disaster, 2016. International Federation of Surveyors.
NTIHINYURWA, P. D., DE VRIES, W. T., CHIGBU, U. E. & DUKWIYIMPUHWE, P. A. 2019. The positive impacts of farm land fragmentation in Rwanda. *Land Use Policy,* 81**,** 565-581.
SAVOIU, C., LEMMEN, C. & SAVOIU, I. 2015. Systematic Registration in Romania a New Opportunity for Land Consolidation. *FIG Working Week - From the wisdom of the ages to the challenges of the modern world.* Sofia, Bulgaria.
VITIKAINEN, A. 2004. An overview of land consolidation in Europe. *nordic Journal of Surveying and real Estate research,* 1.
WAGNER, M. & DE VRIES, W. T. 2019. Comparative Review of Methods Supporting Decision-Making in Urban Development and Land Management. *Land,* 8**,** 123.

BIOGRAPHICAL NOTES

Prof. dr. ir Walter Timo de Vries, wt.de-vries@tum.de , is chair land management and Study Dean Geodesy and Geoinformation at the department of Aerospace and Geodesy at the Technical University Munich. His research interests include smart and responsible land management, public sector cooperation with geoICT and capacity development for land policy. Key themes in his most recent publications advances in responsible and smart land management and land administration, land consolidation, urban and rural development and neocadastres.

CONTACTS

Walter Timo de Vries
Technical University of Munich
Lehrstuhl für Bodenordnung und Landentwicklung / Chair of Land Management
Department of Aerospace and Geodesy
Arcisstraße 21, 80333 München
GERMANY
Tel. +49 89 289 25799 : mobile : +49 (0) 174 204 1171
wt.de-vries@tum.de
Website: https://www.lrg.tum.de/bole/startseite/