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研究課題名（和文）都市の食遷移と食料安全保障・環境持続可能性との関連について：アフリカの事例

研究課題名（英文）Urban diet transition and its relationship to food security and environmental sustainability: the case of Africa.

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交付決定額（研究期間全体）：（直接経費）　　18,800,000円

研究成果の概要（和文）：このプロジェクトでは、システマティックレビュー、家庭調査、専門家へのインタビューを通じて、アフリカの都市における食生活の変化の特徴、要因、影響について調査した。調査では、都市における非常に多様な食生活の変化が確認され、超加工食品（UPF）や肉製品の消費が増加していることが特徴的であった。これは社会の貧困層が購入できる安価な食品を輸入する傾向にあるスーパーマーケット・チェーンの急増によって、この種の食品の入手性が高まったことと関連している。一部の都市ではライフスタイルや生活の変化も、この地域の食生活の変化の要因と影響に非常に関連性があることが示され、統合的な介入の必要性が示唆された。

研究成果の学術的意義や社会的意義
The academic significance lies in the comprehensive exploration of diet change in multiple African cities, beyond the fragmented knowledge from single cities. The results offer valuable insights for policies and interventions that promote healthy and sustainable diet shifts.

研究成果の概要（英文）：This project explored the characteristics, drivers and impact of diet change in African cities through systematic reviews, household surveys and expert interviews. Approximately 500-700 household surveys were conducted in Nairobi, Lilongwe, Maputo and Accra, Kumasi, and Tamale. The surveys identified very diverse diet changes between and within cities, usually characterized by the growing consumption of ultra-processed food (UPF) and meat products. These diet changes were usually associated with the increased availability of this type of food from proliferating supermarket chains that tend to import cheap food which is affordable to poorer segments of society. Changes in urban lifestyles and livelihoods were equally important drivers in some urban contexts. The expert interviews were systematized through Causal Loop Diagrams (CLDs) that show the very linked nature of the drivers and impacts of urban diet changes in the region, suggesting the need for integrated interventions.

研究分野：Diet transition, Food security, Urbanisation

キーワード：食遷移　都市　サハラ以南のアフリカ　料理用コンロ　貧困

１．研究開始当初の背景

Sub-Saharan Africa (SSA) has urbanised very rapidly in the past decades. The most visible indicator of this urbanisation process has been the rapid increase in the extent and population of many African cities throughout the region, which exhibits some rather unique patterns compared to other parts of the world. However, beyond these evident spatial and demographic changes, the urbanisation process has had profound ramifications for the livelihoods and consumption behaviour of a large fraction of the region's population.

Dietary changes are perhaps the most visible changes in consumption behaviour observed in SSA cities across the continent. Several studies have observed different types of urban dietary change mainly associated linked to an increasing consumption of ultra-processed food (UPF) and meat products at the expense of traditional types of food, often based on maize and other local cereals, tubers and legumes. In some urban contexts, it is also possible to observe increases in the consumption of some fresh produce (e.g. fruits and vegetables) and fish, though such patterns are rather different between urban contexts.

Several factors have been driving these types of urban dietary changes. One of the most important has been the significant changes in the availability of certain food items in large cities due to the proliferation of supermarket chains that can make available in large quantities cheap imported food that can be preserved over larger period (e.g. frozen food, canned food). This type of food can appeal to many of the poorer residents of large SSA cities, which are largely depending on purchased food to meet their nutritional needs as they are often unable to produce their own food as in rural areas. Furthermore, the increasing income and shifts in the lifestyles and working conditions of many urban residents have equally facilitated the shift towards different types of food that can be prepared quickly (e.g. rice) or are already prepared. This type of food tends to cater to the time constraints of a growing portion of urban populations that spends increasingly larger fractions of its time working and commuting. Other factors such as advertising, status, access to energy and an assortment of different cultural factors have all influenced different urban dietary changes in cities throughout the continent. It should be noted that although there is a wealth of drivers affecting dietary change in African cities, these drivers can influence radically different changes in the diets of urban residents between and within cities, for example across different income levels, geographical location, and cultural backgrounds.

Collectively such dietary change can have major ramifications for the sustainability of cities and national and local food systems. For example, dietary changes associated with the increased consumption of UPFs or meat products with high salt, sugar and fat content have been linked to increases in obesity and other non-communicable diseases such as diabetes. Furthermore, the increased reliance on imported or purchased food can reduce food security at the national and household levels respectively, as well as catalyse the transformation of local food production systems and related livelihoods. Additionally, some of the increasingly popular food items such as UPF, prepared food or meat products have relatively higher resource requirements, and thus greenhouse gas emissions and environmental impacts throughout their value chains.

The above suggest that urban diet changes in SSA are multi-dimensional phenomena that depend on various drivers and can have important ramification for urban sustainability. However, there is little robust and comprehensive information despite the strong signs about the rapid and diverse dietary change in many SSA cities. Relevant studies have tended to rely either on low quality and resolution secondary data, focus on single cities or understand individual drivers or impacts of urban diet change in SSA. As a result, the research landscape about the characteristics, drivers and impacts of dietary change in African cities is very fragmented, giving rise to multiple knowledge gaps that need to be understood properly if we are to disentangle the sustainability ramifications of dietary change in rapidly urbanising SSA.

２．研究の目的

The aim of this research project has been to unravel the characteristics, drivers and impacts of dietary change in different SSA cities. Rather than relying on secondary data, the focus has been on the collection and analysis of primary data from seven SSA cities. These cities have experienced rapid urbanisation in the past decades (albeit showing different patterns), which has affected in different ways the dietary changes among their urban residents. The focus has been the cities of Nairobi (Kenya), Maputo (Mozambique), Lilongwe (Malawi), and Accra, Kumasi, Tamale and Wa (Ghana). The first four (i.e. Nairobi, Maputo, Lilongwe, and Accra) are the primary cities within their respective countries, and as such they have experienced dietary changes much faster than other cities, allowing thus for the identification of early signals in urban dietary changes in their national contexts. Kumasi, Tamale and Wa are secondary cities of different sizes, located in different climatic zones in Ghana. When combined with Accra they can offer detailed information about possible differentiated dietary change depending on city size and climatic conditions. The main research objectives have been:

- To gain a broad understanding of the main characteristics, drivers and impacts of urban diet change in SSA cities (Objective 1)
- To understand how diet changes emerge and affect sustainability on the ground in SSA cities with different characteristics (Objective 2)
- To unravel how these factors intersect and interrelate in urban contexts (Objective 3)

３．研究の方法

For Objective 1, a systematic review was undertaken to understand the main characteristics, drivers and impacts of diet change in SSA cities. The outcomes of this review were used to inform the development of the household survey for the collection of primary data in the study cities.

For Objective 2, approximately 500-700 household surveys were collected in each of the study cities. To achieve the consistent quality of data collection we developed a comprehensive sampling framework across all cities to allow for the collection of a representative sample of urban residents in each city to avoid biases. This entailed the division of cities in sub-city administrative entities based on local information and selecting the weighted sampling based on the population of these entities. Geospatial tools and housing selection rules were established to avoid biases. The household surveys were collected via face-to-face interviews using tablets to facilitate the quality of data capture and transmission. Collectively the developed framework allowed for a good coverage of each city's population capturing well the different socioeconomic strata. The household surveys were analysed through different statistical tools such as descriptive statistics, cluster analysis, and path analysis to allow for the identification of patterns in the observed dietary changes between and within cities, as well as of their sustainability impacts.

For Objective 3, a series of expert interviews was conducted in Accra to identify systematically how the different types of diet changes intersect with the different drivers and impacts. System dynamics tools were used to establish these linkages to systematically understand the different components of diet change in SSA cities. This is used to also put the results of the surveys into perspective.

４．研究成果

The systematic review identified that the diet change is SSA cities is mainly characterised by the increased consumption of some foodstuffs such as rice, chicken, fish, vegetable oil, sugar, and UPFs, and the decreased consumption of traditional foodstuffs such as roots, tubers, and some cereals such as millet. However, diet changes has had major differences between social groups with different incomes, livelihoods and cultural backgrounds, suggesting that there is no comprehensive pattern in urban diet change throughout the region. When it comes to the drivers of diet change the systematic review confirms that the main drivers include (a) income and food expenditure, (b) sociocultural practices, (c) agricultural and trade policies, and standards, (d) increased prevalence of food vendors and supermarkets, and (e) energy access. Furthermore, the main sustainability impacts of diet change fall under the three broad dimensions of (a) health and nutrition impacts, (b) environmental impacts, and (c) socioeconomic impacts. Some specific socioeconomic impacts relate to income from engagement in food vending and retailing (though not always high), and income from engagement in urban agriculture. Some of the individual environmental and health/nutrition impacts include waste generation from packaging and obesity and health problems through non-communicable diseases. Overall, there is an already growing literature at the interface of urbanisation and diet changes in SSA in terms of its characteristics, drivers, and impacts.

The preliminary analysis of the household surveys suggests certain similarities and differences in the types of diet change occurring both between and within cities. For example, there was an observed propensity in all cities to move towards diets that contain a larger proportion of UPF and meat products. This seems to be driven by the increased the availability of this type of food from supermarket chains that gradually dominate the urban foodscapes in all cities. Beyond this increasing availability it was shown that changes in lifestyles and income associated both with shifts towards waged work and longer commuting and working times have contributed substantially to this increasing prominence in UPF diets. Interestingly, other lifestyle changes, such as the demand for fresh produce, have led to an increasing role of urban agriculture in shaping urban diet change for some segments of the population. Furthermore, the household surveys also reflect the critical role of changes in energy access in shaping urban diets. For example, the increased access to electricity for many urban residents has led to an increasing preference for food that can easily be stored and reheated. However, some of these factors were radically different between men and women and income groups. For example, men prefer meals taken away from home, especially fast food, while women, depending on their energy choice, prefer to cook in large quantities, store and reheat. Furthermore, a large fraction of poor urban dwellers often patronise street food vendors while the middle and high income groups patronise restaurants. These choices have different implications on diet changes.

Finally, the expert interviews conducted in Accra were consolidated through Causal Loop Diagrams (Figure 1) that allows for a systematic understanding of how the different diet changes intersect with drivers and sustainability impacts. Overall Figure 1 shows these intersections and suggests that diet changes in Accra, and possibly other SSA cities are characterised by (a) centrality of UPFs in urban diet

changes, (b) emergence of supermarkets as key nodes in urban foodscapes, (c) balancing role of urban agriculture, and (d) underappreciated role of energy access.

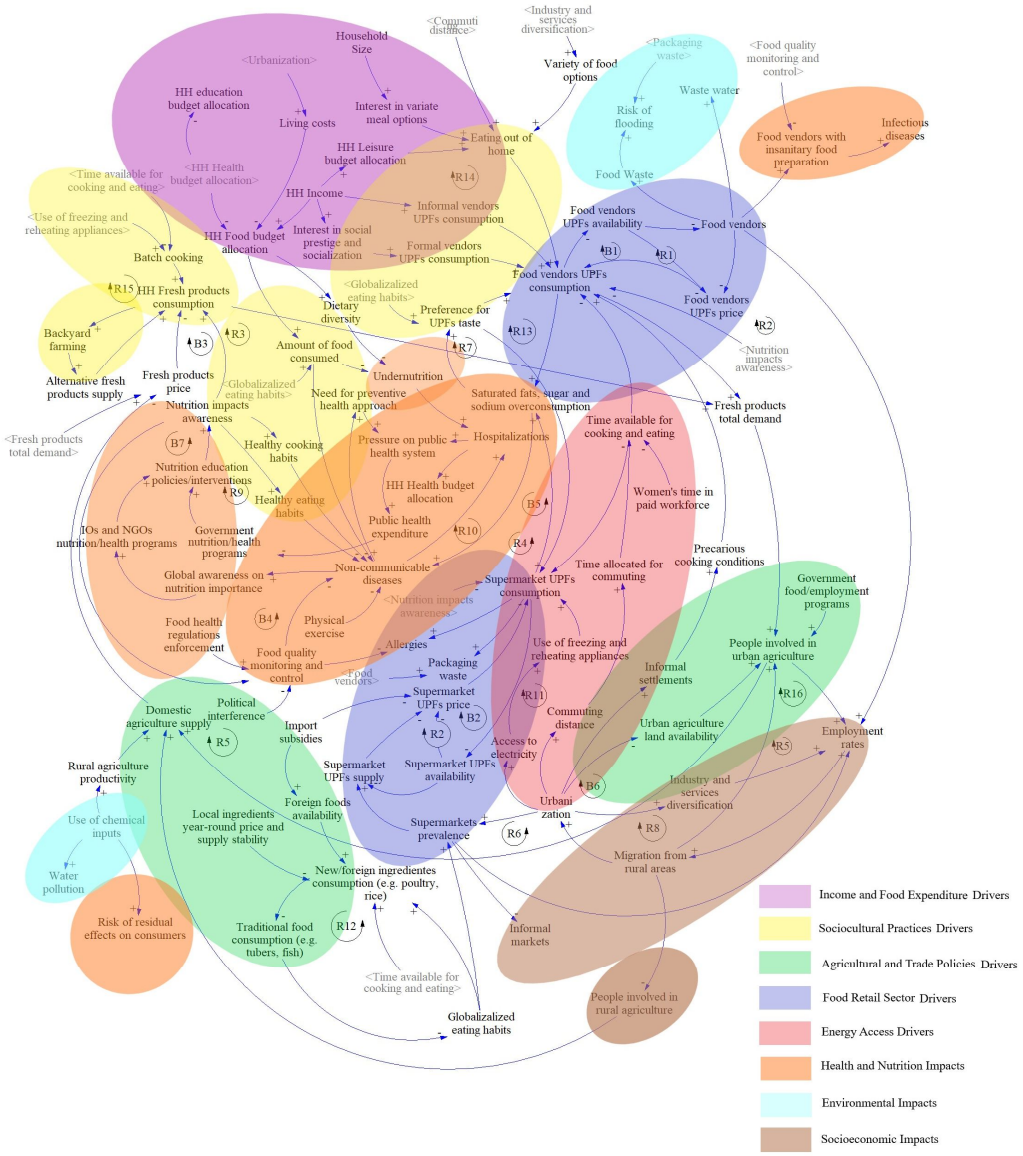

Figure 1: Causal loop diagrams of diet change in Accra, Ghana. Source (Ahmed et al, submitted).

As of the writing of this report, collectively 7 peer-reviewed papers have been published and 7 more are under different stages of submission. Furthermore, two edited volumes for Springer Nature were published, and two special issues were under editing for the journals *Sustainability Science* and *Frontiers in Sustainable Food Systems*.

Academic output (PI in bold)

Journal Issues

Gasparatos, A., Rigollot, C., Pereira, L., exp. 2022. Transdisciplinary research for understanding and transforming food systems. *Frontiers in Sustainable Food Systems*, Available at: https://www.frontiersin.org/research-topics/23068/transdisciplinary-research-for-understanding-and-transforming-food-systems

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Books

Gasparatos, A., Ahmed, A., Naidoo, M., Karanja, A., Fukushi, K., Saito, O., Takeuchi, K., (Eds.), 2020. Sustainability Challenges in Sub-Saharan Africa I: Continental Perspectives and Insights from Western and Central Africa. Springer, Berlin.

Gasparatos, A., Naidoo, M., Ahmed, A., Karanja, A., Fukushi, K., Saito, O., Takeuchi, K., (Eds.), 2020. Sustainability Challenges in Sub-Saharan Africa II: Insights from Eastern and Southern Africa. Springer, Berlin.

Journal papers (Accepted)

Gasparatos, A., Ahmed, A. Voigt, C., 2021. Facilitating policy responses for renewable energy and biodiversity. *Trends in Ecology and Evolution*, **36**, 377-380

Jarzebski, M.P., Elmqvist, T., **Gasparatos, A.,** Fukushi, K., Eckersten, S., Haase, D., Goodness, J., Khoshkar, S., Saito, S., Takeuchi, K., Theorell, T., Dong, N., Kasuga, F., Watanabe, R., Sioen, G.B., Yokohari, M., Pu, P., 2021. Ageing and population shrinking: Implications for sustainability in the Urban Century. *npj Urban Sustainability*, **1**: 17

Karanja, A., **Gasparatos, A.,** 2020. Adoption of improved biomass stoves in Kenya: a transect-based approach in Kiambu and Muranga counties. *Environmental Research Letters*, **15**: 024020

Ebi, K.L., Harris, F., Sioen, G.B., Wannous, C., Anyamba, A., Bi, P., Boeckmann, M., Bowen, K., Cissé, G., Dasgupta, P., Dida, G.O., **Gasparatos, A.,** Gatzweiler, F., Javadi, F., Kanbara, S., Kone, B., Maycock, B., Morse, A., Murakami, T., Mustapha, A., Pongsiri, M., Suzan, G., Watanabe, C., Capon, A., 2020. Transdisciplinary research priorities for human and planetary health in the context of the 2030 Agenda for Sustainable Development. *International Journal of Environmental Research and Public Health*, **17**: 8890

Karanja, A., Mburu, F., **Gasparatos, A.**, 2020. A multi-stakeholder perception analysis of the adoption, impacts and priority areas in the Kenyan clean cooking sector. *Sustainability Science*, **15**, 333–351.

Karanja, A., **Gasparatos, A.,** 2019. Adoption and impacts of clean bioenergy stoves in Kenya. *Renewable and Sustainable Energy Reviews*, **102**, 285-306.

Lindgren, E., Harris, F., Dangour, A.D., **Gasparatos, A.,** Hiramatsu, M., Javadi, F., Loken, B., Murakami, T., Scheelbeek, P., Haines, A., 2018. Sustainable food systems: A health perspective. *Sustainability Science*, **13**, 1505–1517

Chapters

Gasparatos, A., Ahmed, A., Naidoo, M., Karanja, A., Fukushi, K., Saito, O., Takeuchi, K., 2020. Sustainability challenges in Sub-Saharan Africa: Trade-offs, opportunities and priority areas for Sustainability Science, in Gasparatos, A., Ahmed, A., Naidoo, M., Karanja, A., Fukushi, K., Saito, O., Takeuchi, K., (Eds.), Sustainability Challenges in Sub-Sahara Africa II: Insights from Eastern and Southern Africa. Springer, Berlin, pp. 245-262

Johnson, F.X., Batidzirai, B., Iiyama, M., Ochieng, C.A., Olsson, O., **Gasparatos, A.,** 2020. Enabling sustainable bioenergy transitions in Sub-Saharan Africa: strategic issues for achieving climate-compatible development in Gasparatos, A., Ahmed, A., Naidoo, M., Karanja, A., Fukushi, K., Saito, O., Takeuchi, K., (Eds.), Sustainability Challenges in Sub-Saharan Africa I: Continental Perspectives and Insights from Western and Central Africa. Springer, Berlin, 51-80

Juju, D., Baffoe, G., Dam Lam, R., Karanja, A., Naidoo, M., Ahmed, A., Jarzebski, M.P., Saito, O., Fukushi, K., Takeuchi, K., **Gasparatos, A.,** 2020. Sustainability challenges in Sub-Saharan Africa in the context of the Sustainable Development Goals (SDGs), in Gasparatos, A., Ahmed, A., Naidoo, M., Karanja, A., Fukushi, K., Saito, O., Takeuchi, K., (Eds.), Sustainability Challenges in Sub-Saharan Africa I: Continental Perspectives and Insights from Western and Central Africa. Springer, Berlin, pp. 3-50

Balde, B.S., Karanja, A., **Gasparatos, A,** 2020. Impact of household energy consumption and livelihood activities on coastal forests in Guinea, in Gasparatos, A., Ahmed, A., Naidoo, M., Karanja, A., Fukushi, K., Saito, O., Takeuchi, K., (Eds.), Sustainability Challenges in Sub-Saharan Africa I: Continental Perspectives and Insights from Western and Central Africa. Springer, Berlin, pp. 221-244

Journal papers (Under Submission)

Gasparatos, A., Su, J., Ahmed, A., Karanja, A. Characteristics and drivers of urban diet changes in African cities. Submitted to *Global Food Security*

Huynh, L., **Gasparatos, A.** A systematic review of the drivers and impacts of urban diet change in Sub-Saharan Africa. Submitted to *Food Policy*

Naidoo, M., **Gasparatos, A.** Consumer worldviews and perspectives on environmental sustainability initiatives in the South African supermarket sector. Submitted to *Journal of Cleaner Production*

Dam Lam, R., Huynh, L.T.M., **Gasparatos, A.** Diet change and sustainability in indigenous settings: Characteristics, drivers, and impacts of diet change in Gunayala, Panama. Submitted to *Sustainability Science*

Ahmed, A., Lozano, D., Alatinga, K.A., **Gasparatos, A.** From Ampesie to French Fries: Systematising the characteristics, drivers and impacts of diet change in rapidly urbanising Accra. Submitted to *Sustainability Science*

Yussif, K., Dompreh, E.B., **Gasparatos, A**. Sustainability of urban expansion in Africa: A systematic literature review using the Drivers-Pressures-State-Impacts-Responses (DPSIR) framework. Submitted to *Sustainability Science*

Wu, W., **Gasparatos, A.,** Huynh, L., Takakura, J., Iiyama, M., Liu, M., Hasegawa, T., Fujimori, S., Takahashi, K. Sustainable dietary transition for human and planetary health: a narrative review of its urgency, potential concerns, and transition pathways. Submitted to *Sustainability Science*

５．主な発表論文等

〔雑誌論文〕　計4件（うち査読付論文　4件／うち国際共著　4件／うちオープンアクセス　2件）

１．著者名 Karanja, A., Gasparatos, A	４．巻 15
２．論文標題 Adoption of improved biomass stoves in Kenya: a transect-based approach in Kiambu and Muranga counties	５．発行年 2020年
３．雑誌名 Environmental Research Letters	６．最初と最後の頁 24020
掲載論文のDOI（デジタルオブジェクト識別子） 10.1088/1748-9326/ab63e2	査読の有無 有
オープンアクセス オープンアクセスとしている（また、その予定である）	国際共著 該当する

１．著者名 Karanja, A., Mburu, F., Gasparatos, A.	４．巻 15
２．論文標題 A multi-stakeholder perception analysis of the adoption, impacts and priority areas in the Kenyan clean cooking sector	５．発行年 2020年
３．雑誌名 Sustanability Science	６．最初と最後の頁 333-351
掲載論文のDOI（デジタルオブジェクト識別子） 10.1007/s11625-019-00742-4	査読の有無 有
オープンアクセス オープンアクセスではない、又はオープンアクセスが困難	国際共著 該当する

１．著者名 Karanja, A., Gasparatos, A.,	４．巻 102
２．論文標題 Adoption and impacts of clean bioenergy stoves in Kenya	５．発行年 2019年
３．雑誌名 Renewable and Sustainable Energy Reviews	６．最初と最後の頁 285, 306
掲載論文のDOI（デジタルオブジェクト識別子） 10.1016/j.rser.2018.12.006	査読の有無 有
オープンアクセス オープンアクセスではない、又はオープンアクセスが困難	国際共著 該当する

１．著者名 Lindgren, E., Harris, F., Dangour, A.D., Gasparatos, A., Hiramatsu, M., Javadi, F., Loken, B., Murakami, T., Scheelbeek, P., Haines, A	４．巻 13
２．論文標題 Sustainable food systems - A health perspective	５．発行年 2018年
３．雑誌名 Sustainability Science	６．最初と最後の頁 1505, 1517
掲載論文のDOI（デジタルオブジェクト識別子） 10.1007/s11625-018-0586-x	査読の有無 有
オープンアクセス オープンアクセスとしている（また、その予定である）	国際共著 該当する

〔学会発表〕　計3件（うち招待講演　1件／うち国際学会　0件）

1．発表者名 Gasparatos, A.
2．発表標題 Some critical considerations for future society design
3．学会等名 Tsukuba Conference
4．発表年 2019年

1．発表者名 Gasparatos, A.
2．発表標題 Sustainable food systems in Sub-Saharan Africa
3．学会等名 Invited seminar at University of Antwerp（招待講演）
4．発表年 2019年

1．発表者名 Gasparatos, A.
2．発表標題 Urban dietary transitions in Sub-Sahara Africa: Drivers and Impacts
3．学会等名 2nd Stockholm-Tokyo Workshop - Ageing societies: Sustainability and Resilience Challenges in the Urban Century
4．発表年 2018年

〔図書〕　計2件

1．著者名 Gasparatos, A., Naidoo, M., Ahmed, A., Karanja, A., Fukushi, K., Saito, O., Takeuchi, K., (Eds.)	4．発行年 2020年
2．出版社 Springer, Berlin	5．総ページ数 360
3．書名 Sustainability Challenges in Sub-Saharan Africa I: Continental Perspectives and Insights from Western and Central Africa	

１．著者名 Gasparatos, A., Ahmed, A., Naidoo, M., Karanja, A., Fukushi, K., Saito, O., Takeuchi, K., (Eds.)	４．発行年 2020年
２．出版社 Springer, Berlin	５．総ページ数 268
３．書名 Sustainability Challenges in Sub-Saharan Africa II: Insights from Eastern and Southern Africa	

〔産業財産権〕

〔その他〕

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６．研究組織

	氏名 （ローマ字氏名） （研究者番号）	所属研究機関・部局・職 （機関番号）	備考

７．科研費を使用して開催した国際研究集会

〔国際研究集会〕　計0件

８．本研究に関連して実施した国際共同研究の実施状況

共同研究相手国	相手方研究機関