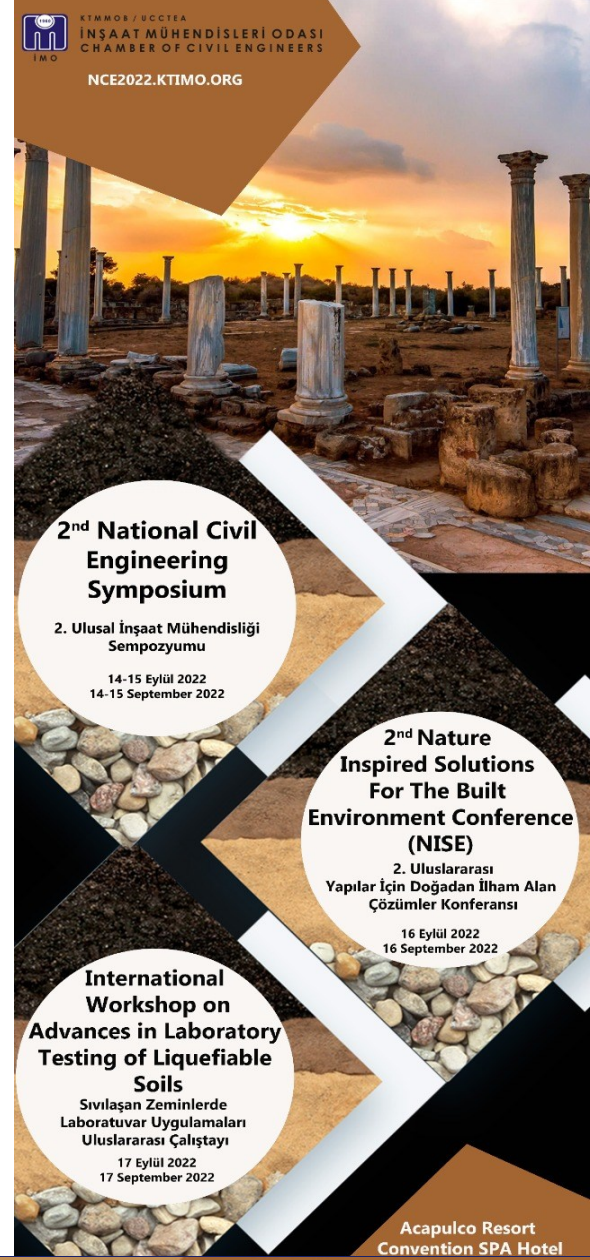


Estimations of savings for recycling construction and demolition waste on islands: A case study of northern part of Cyprus

Cemaliye Özverel Ekinci* & İme Akanyeti**

*European University of Lefke

**Cyprus International University



Solid Waste Problem

“Take, make, and dispose” Pattern – Unprecedented level of growth, resource supply risks, waste

- Increase in global Solid Waste generation rate (0.3 Mt/day in 1900; 3.5 Mt/day in 2010) (Zhang, C. et al., 2022)

Especially in **small islands** solid waste management has more challenges (Wang et al, 2021):

- Geographic isolation
- Tourism-driven economy

Construction and Demolition Waste (CDW)

China: 704 Mt in 2018

US: 600 Mt in 2018 (recovery rate 76%)

EU28: 372 Mt in 2020 (exc. excavated soils)
(recovery rate **90%**)

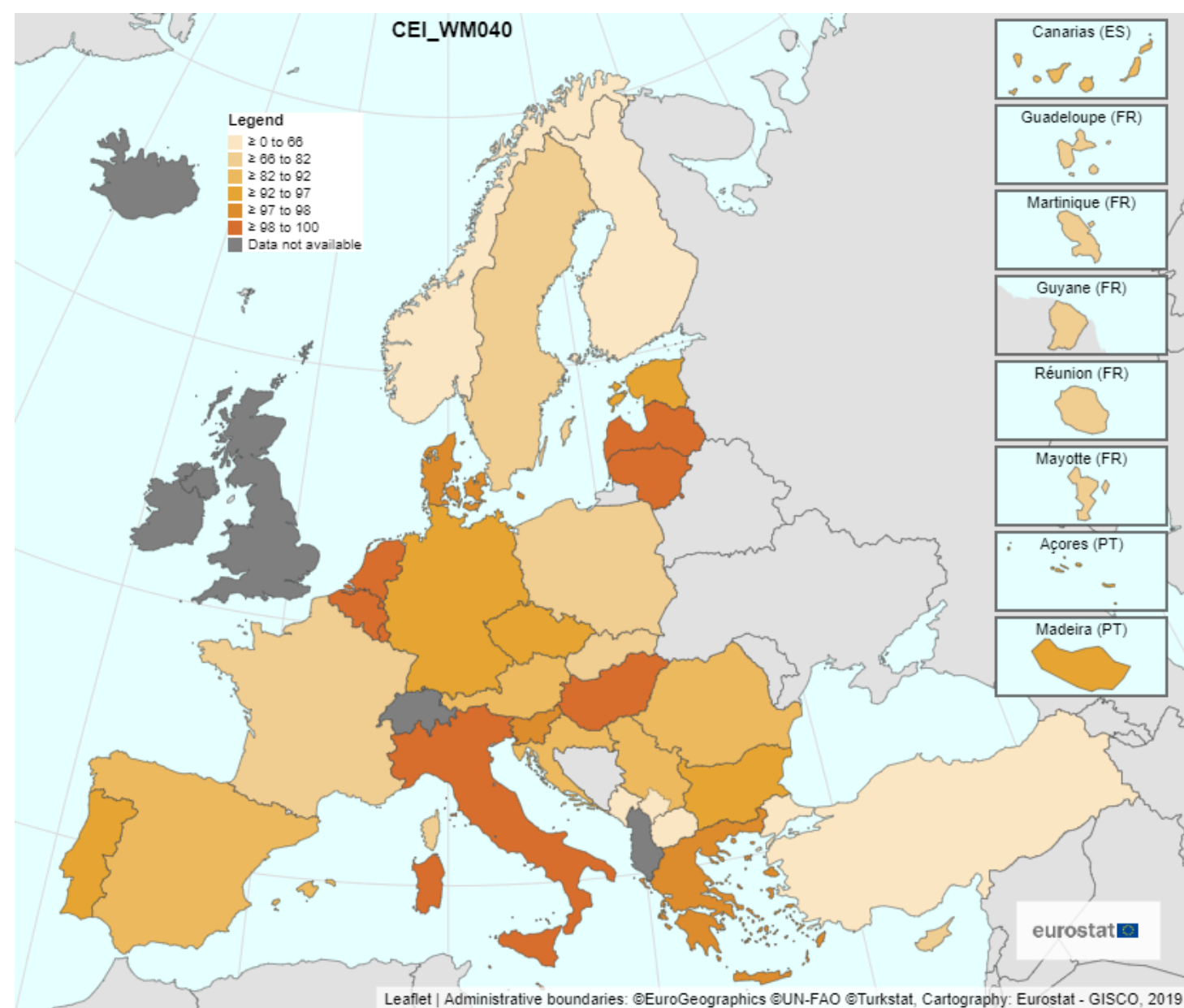
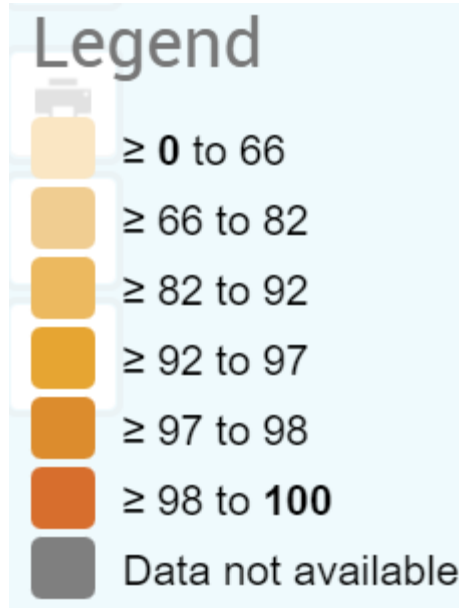
1975, EU Directive on Waste

2008, EU Waste Framework Directive

Re-use, recycling and other material recovery of
hazardous CDW - %70 by weight

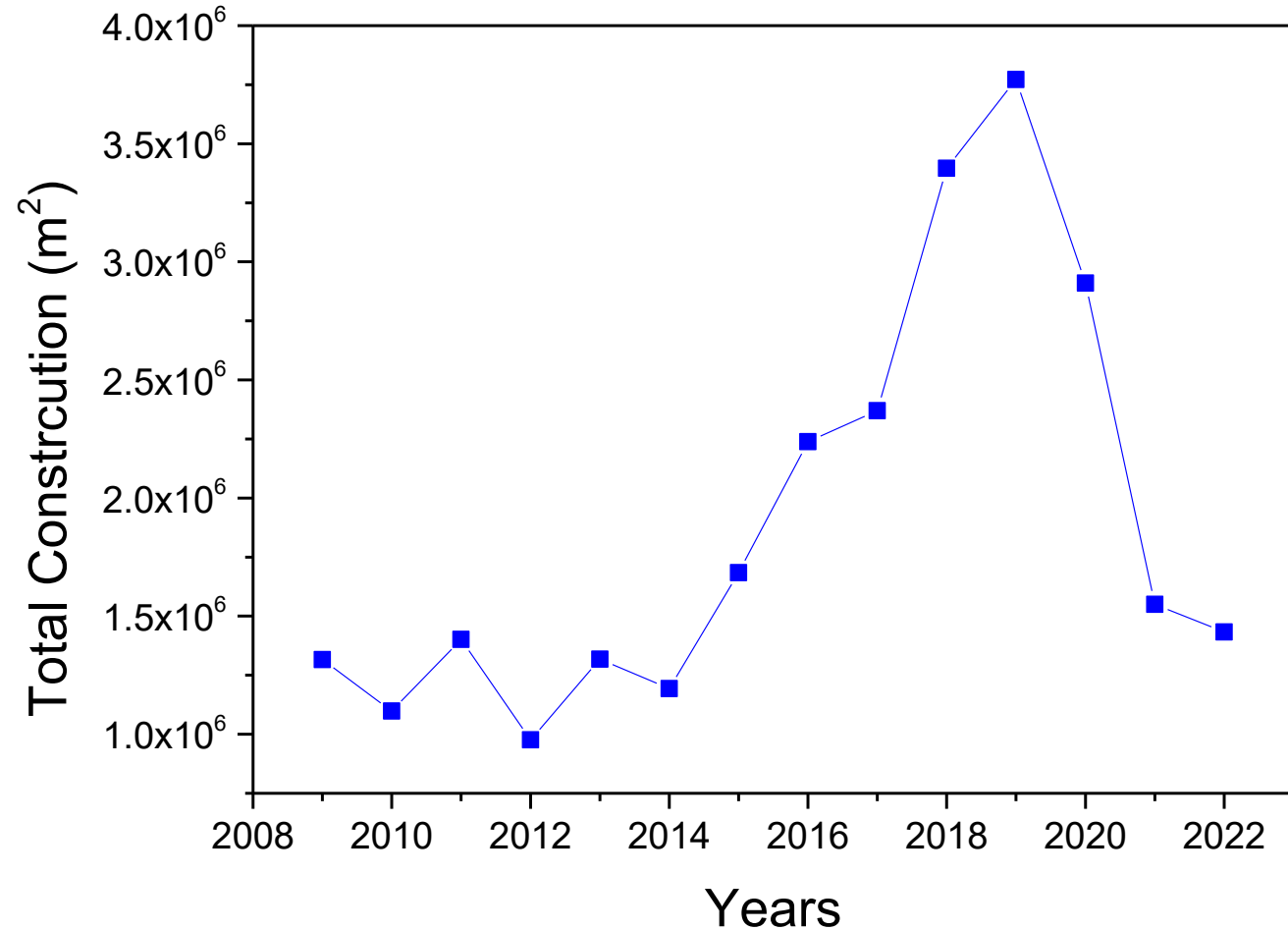


CDW Recovery Rate in EU



CONSTRUCTION IN NORTH CYPRUS

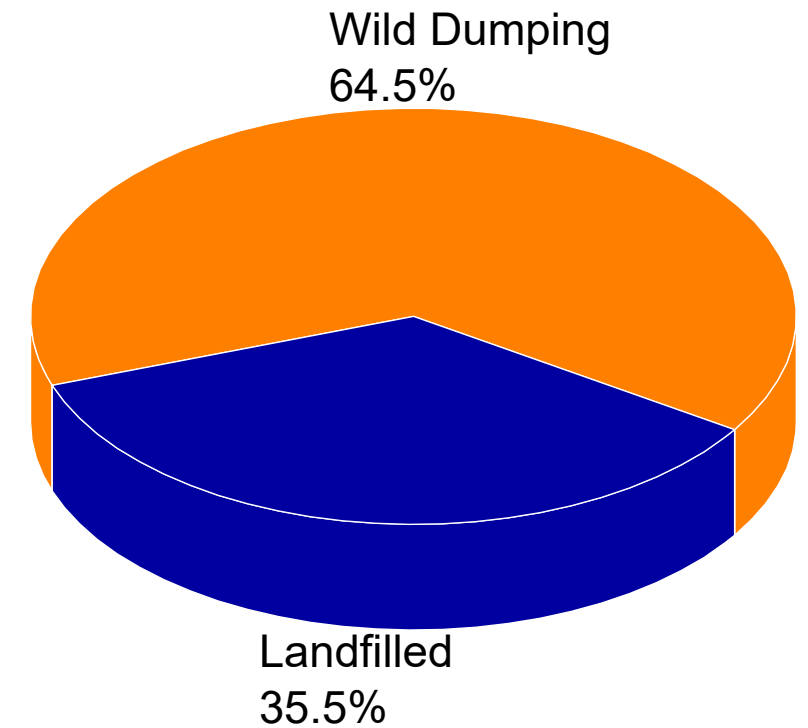
- Construction sector is one of the leading economical sectors in North Cyprus especially since 2005 (after Annan Plan)



C&D Waste Problem

Based rough estimates (2015):

- 110,000 tons construction and demolition waste
- 39,000 tons → Güngör Constructed Landfill
- The rest → Wild dumping



**THE ONLY INFORMATION
AVAILABLE ON CDW IN
NORTH CYPRUS**

Lack of CDW recovery/recycling → more quarries

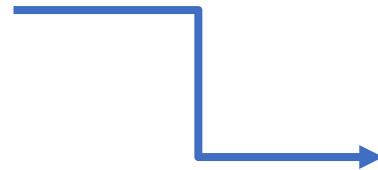
Currently: 651,000 m² area , 36 companies

- 16 → crashed stone sand
 - 11 → float stone
 - 6 → cut stone
 - 2 → gypsum
 - 1 → river sand and gravel
- (Ilseven&Kasot, 2020)

RELIABLE DATA ON

CDW GENERATION RATE
(regional)

CDW COMPOSITION



Essential to
develop a
sustainable
waste
management
system

Research Objectives

- To determine the total and regional generation rate of construction and demolition waste in northern part of Cyprus
- To determine the quantities of recyclable/recoverable materials in C&D waste
- To estimate the potential energy and material savings considering the implementation of an effective recycling system

Data Collection

- Data on total m² of structures with a construction permission per region per year (2009-2020) → collected (Records of Chamber of Civil Engineers)
- Data on total m² of demolished/constructed structures → to be collected from municipalities
- Survey results (on the quantities/compsition of CD waste generated during construction and demolition) → to be collected from contractors, engineers, companies
- Assumptions → from the literature

PRELIMINARY RESULTS



K.T.M.M.O.B.
İNŞAAT MÜHENDİSLERİ ODASI
CHAMBER OF CIVIL ENGINEERS



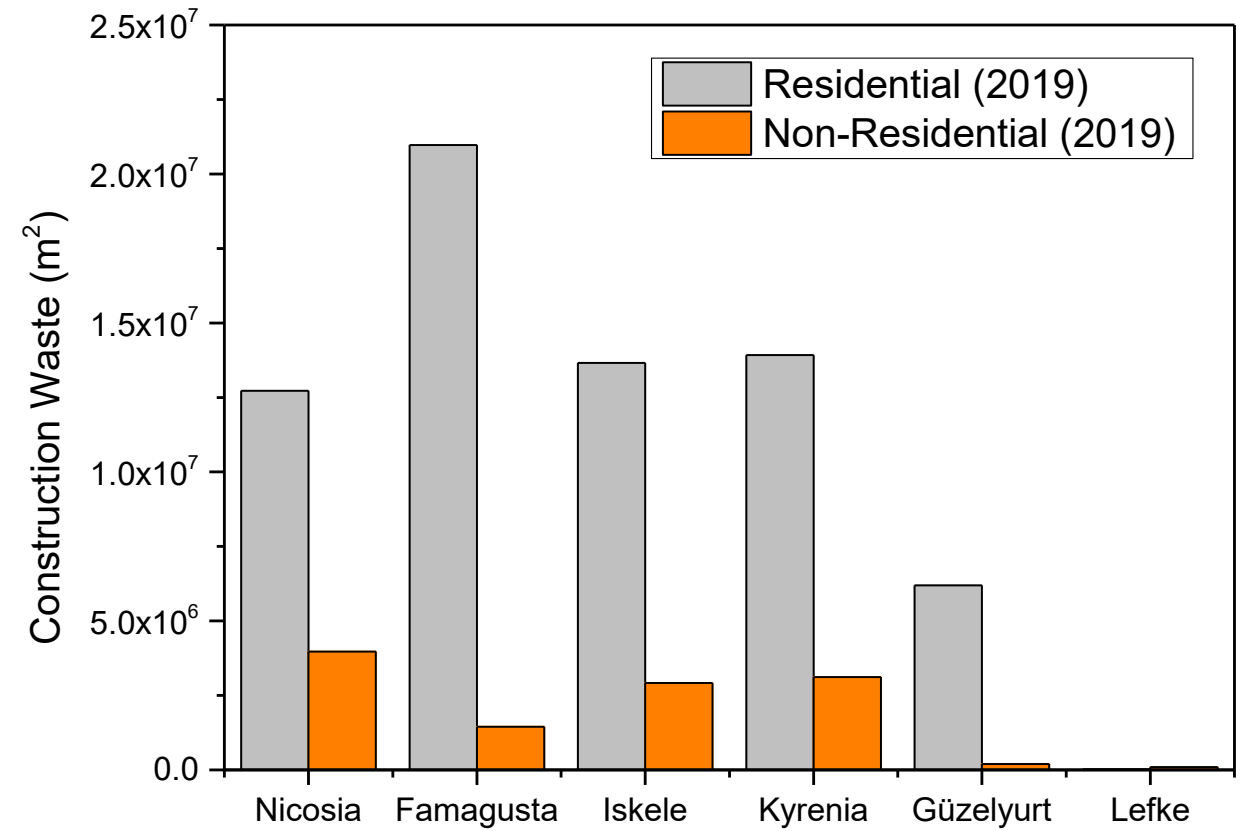
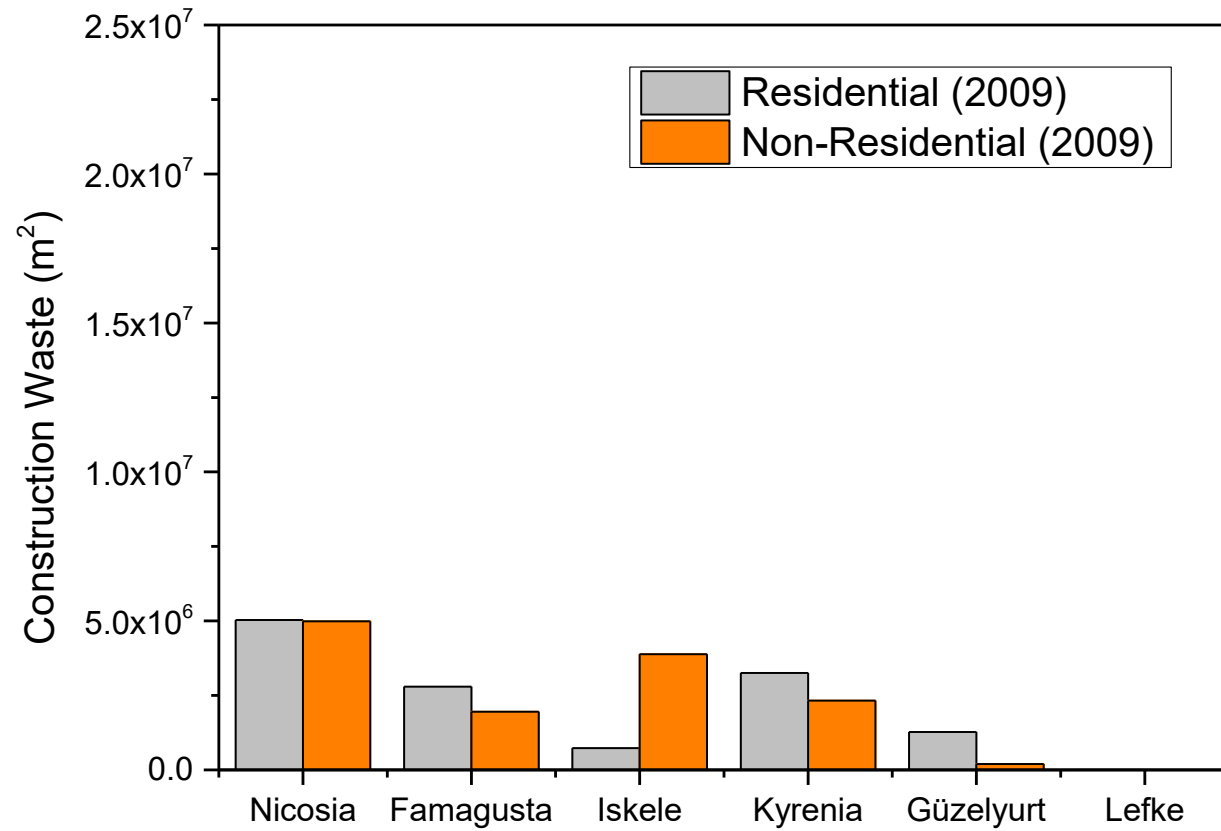
Bahçeşehir
Cyprus University



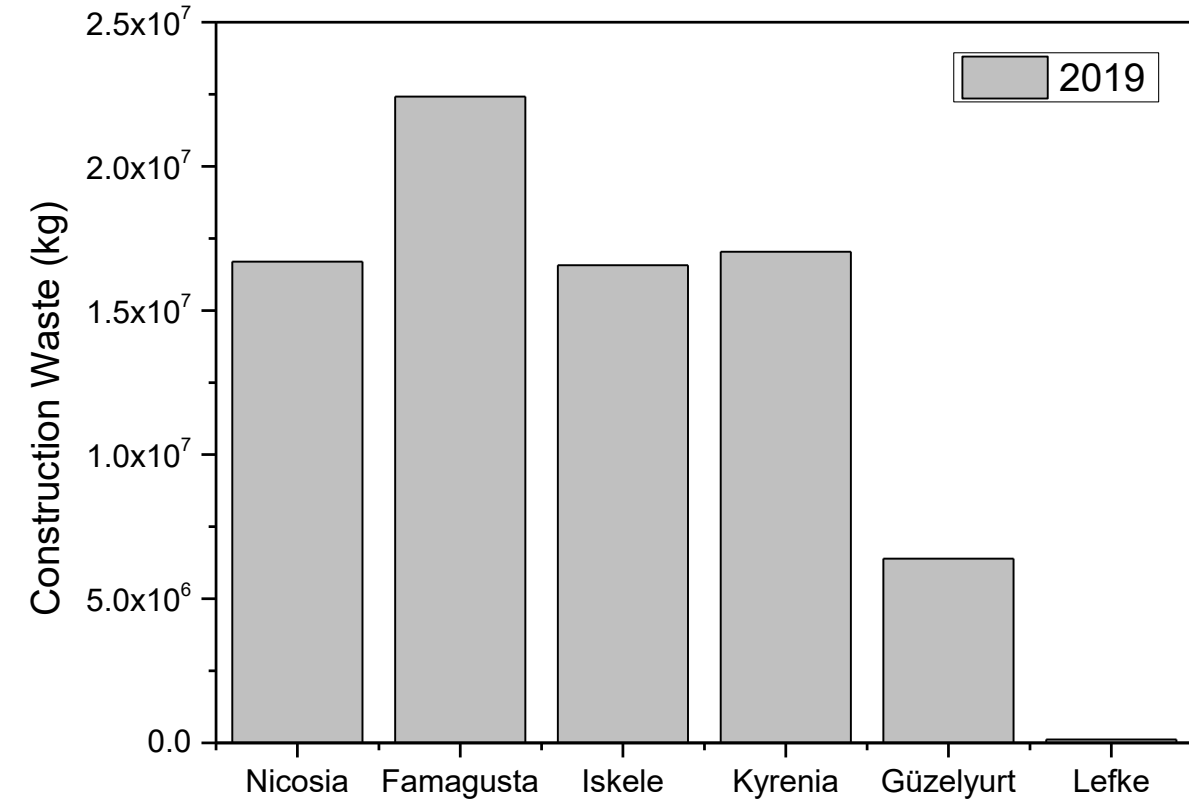
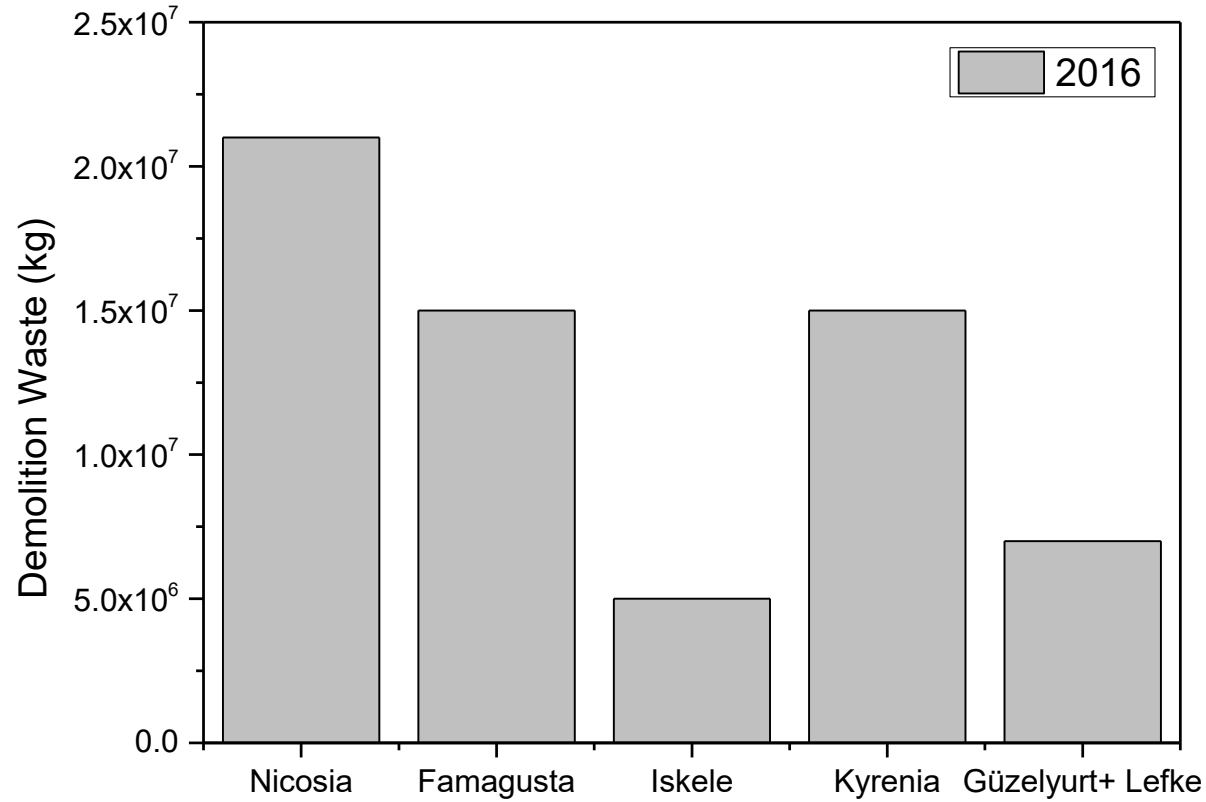
North Cyprus

14 -17 Eylül 2022
14 - 17 September 2022

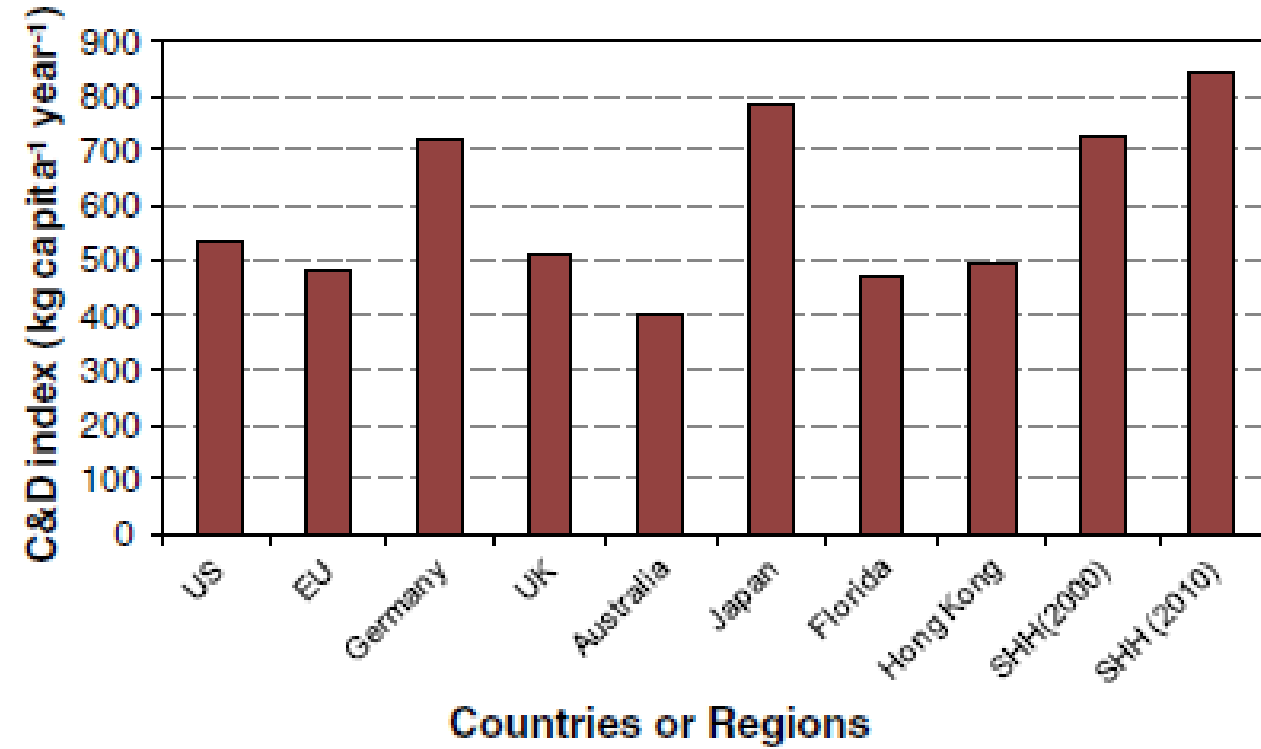
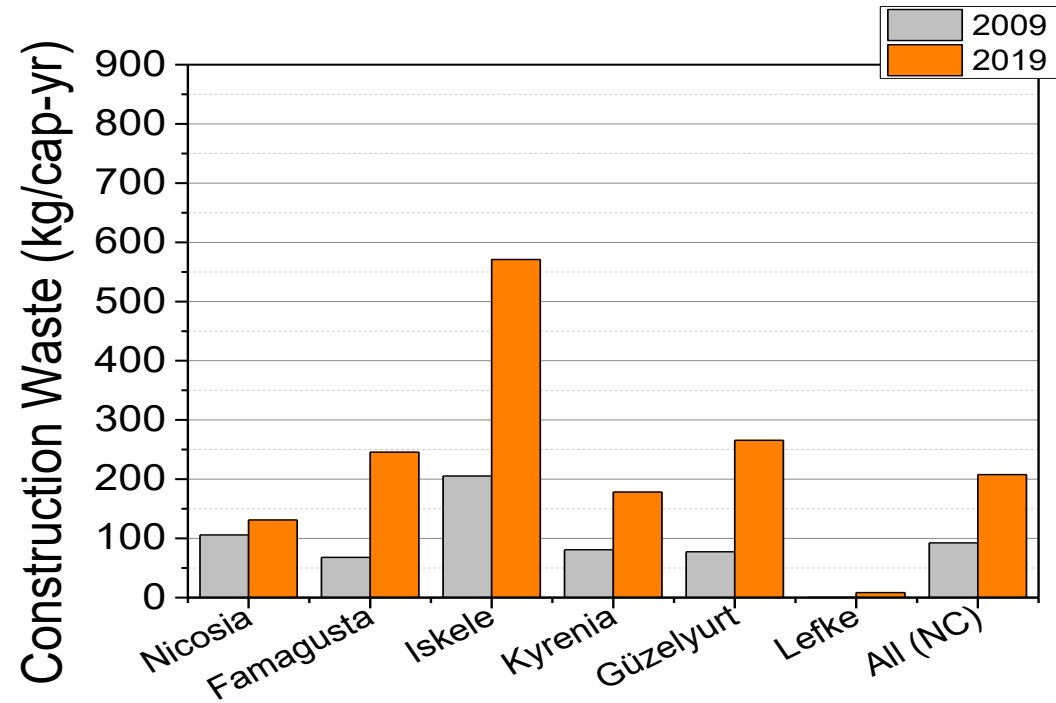
Construction Waste



Demolition vs Construction Waste

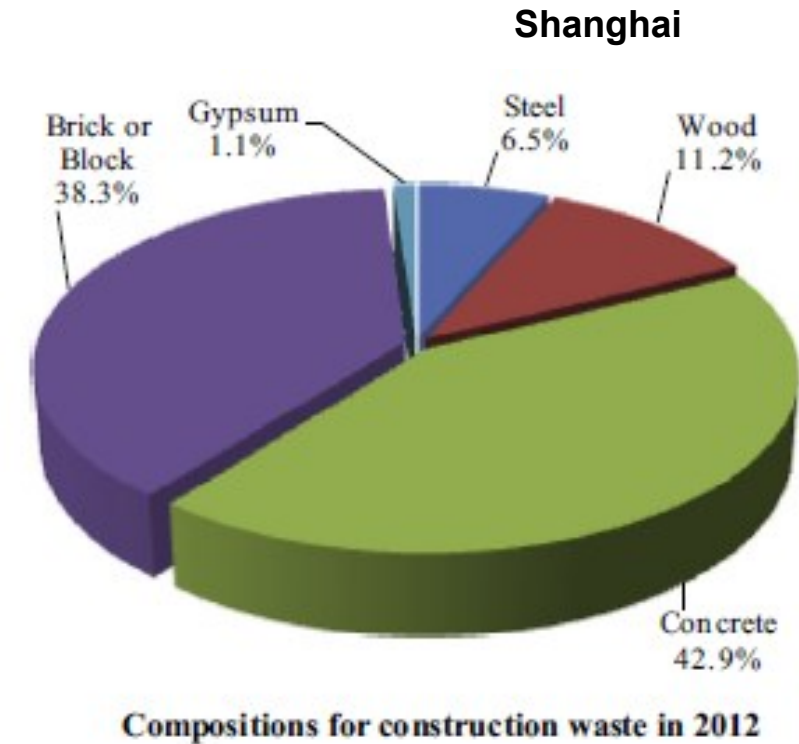
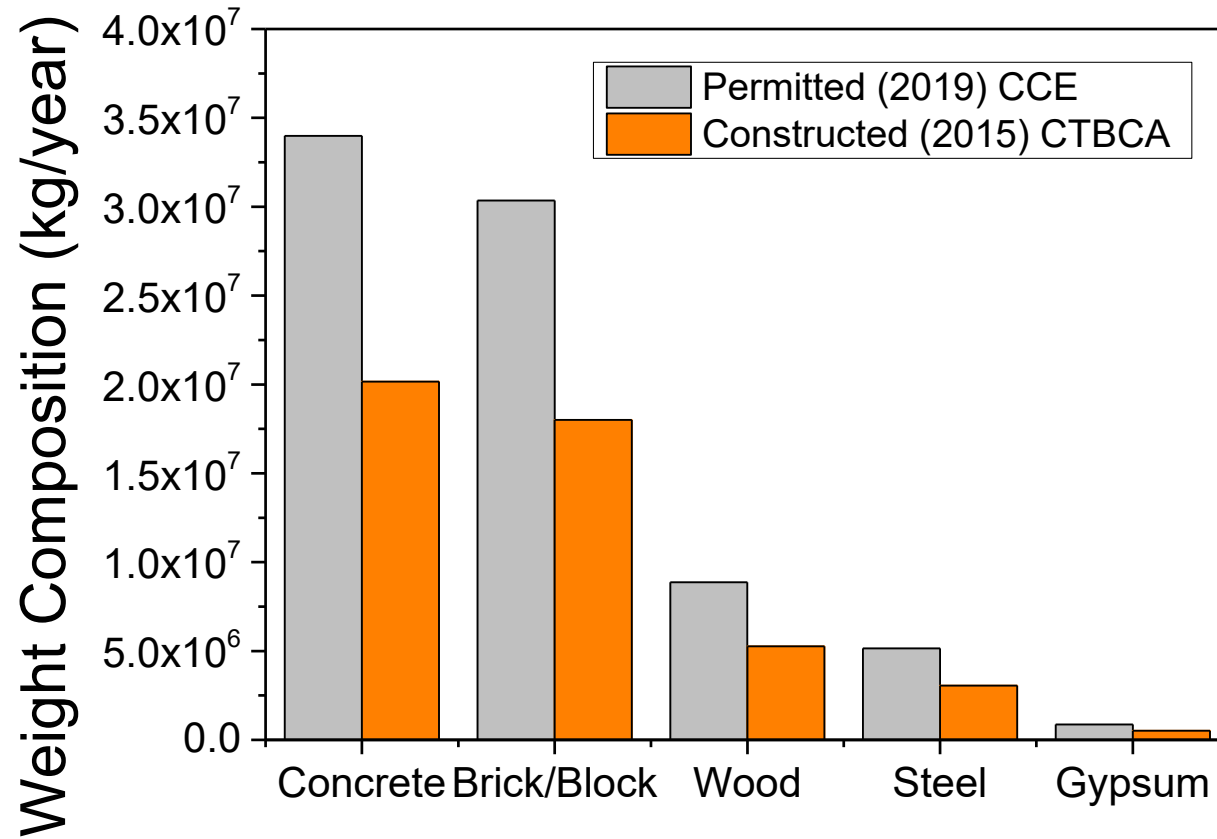


Construction Waste Index



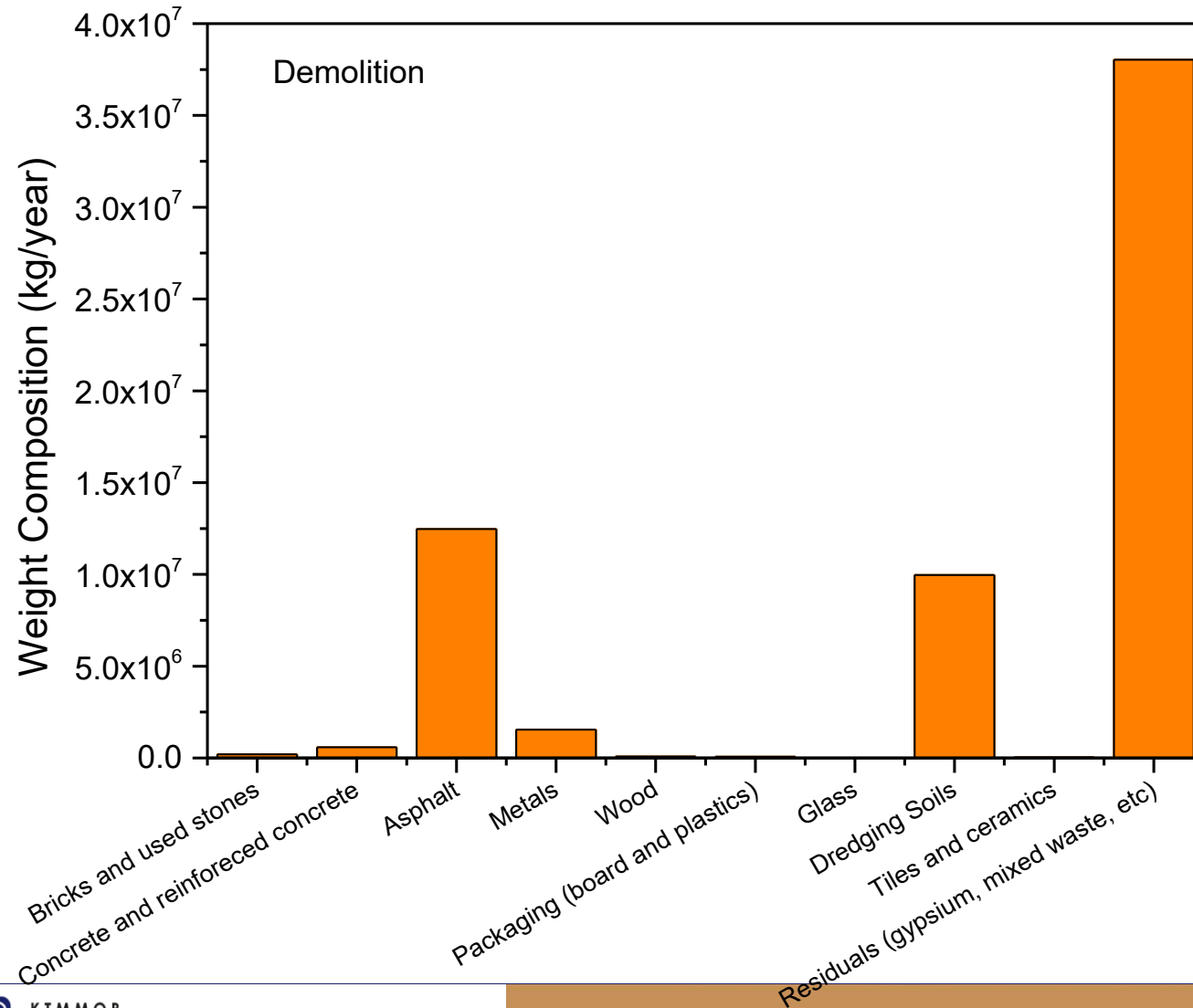
Ref: T. Ding, J. Xiao / Waste Management 34 (2014) 2327–2334

Construction Waste Composition



Ding et al, 2014

Demolition Waste Composition



Waste Types	Percentiles	GCC 2015 tons/yr
1. Excavation Material (mainly soils and other naturally occurring materials)		496,668.00
2. Construction and Demolition Waste		90,965.00
Bricks and Used stones (soft stone, hard stone)	0.32	291.00
Concrete and reinforced concrete	0.93	848.00
Asphalt	19.80	18,011.00
Metals	2.45	2,226.00
Wood	0.13	120.00
Packaging (board and plastics)	0.12	110.00
Glass	0.00	1.00
Dredging Soils	15.83	14,398.00
Tiles and ceramics	0.05	44.00
Residuals (gypsum, mixed waste, etc.)	60.37	54,916.00
TOTAL		587,633.00

Table 6. GCC EUROSTAT statistics for types of waste streams in CDW.

Conclusions and Further Studies

- Four times more buildings received project approval in 2019 compared to 2009 resulting in a considerable increase in CDW generation rate.
- Regional waste generation rates should be considered; eg: construction waste is considerable larger than the demolition waste in İskele and Famagusta
- Construction waste index of İskele in 2019 is larger than many developed countries (US, EU, UK and Australia)
- Quantities of waste composition is estimated based on the literature assumptions however local data collection/generation are required for scientific evaluation of the generation and possible recovery rates.

References

- Coelho, A., & De Brito, J. (2012). Influence of construction and demolition waste management on the environmental impact of buildings. *Waste Management*, 32(3), 532-541.
- CTCBCA, 2017. CDW Management Plan for TCc.
- DPÖ, 2019. Yerel Yönetimler Raporu 2017-2019.
- EAY, 2019. Entegre Atık Yönetim Planı, Çevre Koruma Dairesi.
- Eurostat Data Browser, 2022. Recovery rate for construction and demolition waste. Website: https://ec.europa.eu/eurostat/databrowser/view/cei_wm040/default/map?lang=en (last accessed: 14/9/2022)
- Mah, C. M., Fujiwara, T., & Ho, C. S. (2016). Construction and demolition waste generation rates for high-rise buildings in Malaysia. *Waste Management & Research*, 34(12), 1224-1230.
- Masudi, A. F., Che Hassan, C. R., Mahmood, N. Z., Mokhtar, S. N., & Sulaiman, N. M. (2012). Waste quantification models for estimation of construction and demolition waste generation: a review. *International journal of global environmental issues*, 12(2-4), 269-281.
- Zhang, C., Hu, M., Di Maio, F., Sprecher, B., Yang, X., & Tukker, A. (2022). An overview of the waste hierarchy framework for analyzing the circularity in construction and demolition waste management in Europe. *Science of the Total Environment*, 803, 149892.