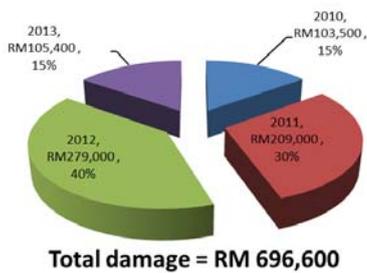


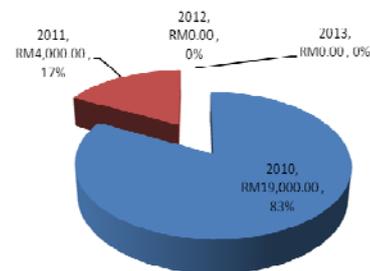
(a)



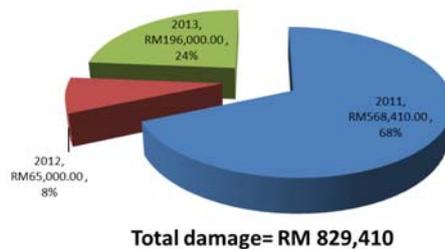
(b)



(c)



(d)



(e)

Fig. 6 Damages and loss due to windstorm occurrences at (a) SPU, (b) SPT, (c) SPS, (d) TL and (e) BD district from year 2010 to 2013

#### 4. CONCLUSIONS

Past windstorm occurrences are very important to understand as preparedness for disaster and mitigation. It is clear that windstorm most likely to occur in the month of April, May and October during the inter-monsoon period. Finding also shown that SPU district suffered the highest windstorm intensity as compared to other districts in

Penang state. Meanwhile, the lowest windstorm occurrences happened in TL from three years data period. However, improvement of windstorm database remains as priority and challenging to further investigate the windstorm characteristics.

Recommendation for future work that questionnaire shall be distributed to practitioners in order to get feedback on current implementation of building code of practice on wind loading to local house in Malaysia. Meanwhile, post disaster survey need to be carried out to gather information on type of damage and level of damage. Thus, mitigation measures and root caused identification will be obtained to minimize human damage and economic losses and prevent reoccurrence in the future. Although Malaysia is not in cyclone prone region, a good awareness should be taken to reduce the damage and economic loss due to windstorm and loss of life.

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## **REFERENCES**

- Henderson, D. and Ginger, H., (2008), "Role of building codes and construction standard in windstorm disaster mitigation", *The Australian Journal of Emergency Management*, **23**(2), 40-46.
- Majid, T, A., Noram I. R., Ali, M., M, Syamsyul, H, Saad., M, Hasim, I, Zakaria., (2011). Malaysia Country Report 2010.
- Simiu, E. and Scanlan, R.H., (1986). "Wind effects on structures", John Wiley & Sons Inc., New York, Chichester, Brisbane, Toronto, Singapore.
- Tingsanchali, T., (2012) "Urban flood disaster management", *Procedia Engineering*, **32**. 25-37.
- EMDAT [Accessed on 30<sup>th</sup> March 2014] Available from <http://www.em-dat.net> - The OFDA/CRED International Disaster Database, Université Catholique de Louvain - Brussels – Belgium.