Kajian unmanned aerial vehicle (UAV) untuk pemetaan sumberdaya pesisir dan laut pulau kecil = Study of unmanned aerial vehicle (UAV) for coastal and marine resources mapping in small island

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Abstrak

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Pemetaan potensi sumber daya pulau kecil membutuhkan informasi spasial skala detail yang dapat diperoleh dengan cepat. Teknologi penginderaan jauh citra satelit resolusi tinggi yang umum digunakan memiliki beberapa kendala seperti ketersediaan data, tingginya biaya pembelian data, serta adanya hambatan lainnya seperti tutupan awan. Tesis ini melakukan kajian tentang pemanfaatan Unmanned Aerial Vehicle (UAV) untuk pemetaan sumberdaya pesisir dan laut pulau kecil sebagai solusi alternatif pengganti citra satelit resolusi tinggi. Kajian dilaksanakan dengan studi kasus di Pulau Pramuka, Kab. Kepulauan Seribu, DKI Jakarta. Akuisisi data dilaksanakan pada bulan April 2015 dimana dihasilkan citra orthofoto dan model permukaan digital dengan resolusi spasial 10 cm. Analisis data dilakukan dengan menggunakan pendekatan berbasis obyek yang dibandingkan dengan pengolahan citra satelit Worldview-2. Sebagai validator digunakan data survei lapangan pada bulan Juni 2015. Hasil klasifikasi penutup lahan pulau kecil dengan menggunakan UAV memiliki nilai akurasi sebesar 94 % dan habitat perairan dangkal dengan kelas kerapatan sebesar 54 % dan tanpa kelas kerapatan sebesar 68 %. Nilai akurasi citra Worldview-2 untuk penutup lahan sebesar 60 % dan habitat perairan dangkal dengan kelas kerapatan sebesar 38 % dan tanpa kelas kerapatan sebesar 56 %.

Hasil uji akurasi menunjukkan bahwa pengunaan data UAV memberikan hasil lebih baik dibandingkan menggunakan citra satelit Worldview-2. Perbedaan hasil akurasi disebabkan karena perbedaan resolusi spasial, perbedaan informasi tambahan (model permukaan digital), dan adanya efek kilatan pada Worldview-2. UAV memiliki kelebihan dalam akuisisi data yang cepat, resolusi spasial yang sangat tinggi dan adanya data model permukaan digital dibandingkan dengan citra satelit Worldview-2, namun memiliki kekurangan dalam resolusi spektral yang rendah, resiko pada wahana, dan kebutuhan sumberdaya manusia dalam operasional wahana. Pemanfaatan data UAV untuk pemetaan sumberdaya pesisir dan laut pulau kecil dapat menjadi pengganti penggunaan citra satelit yang umum digunakan.
<hr><i>ABSTRACT
Mapping of potential resources on small islands requires very detail spatial information that can be obtained quickly. Remote sensing technology of highresolution (multispectral) satellite imagery which is commonly used has several constraints such as high cost and availability data as well as cloud coverage. This research was conducted in order to study the use of Unmanned Aerial Vehicle (UAV) for mapping coastal and marine resources of small islands as an alternative solution to high-resolution satellite imagery. The research was conducted based on a case study at Pulau Pramuka, Kab. Kepulauan Seribu, DKI Jakarta. The primary data was obtained through an aerial survey carried out on April 2015 where 10 cm spatial resolution of orthofoto imagery and digital surface model were generated. To point out the remarkable use of UAV for coastal and marine resources mapping, a set of Worldview-2 digital imagery was also used for comparison.

Both data analysis were performed using an object-based approach to produce land cover and shallow water habitat classes. Furthermore, field check data on June 2015 were used to validate the classification result. The thematic accuracy of land cover classification using UAV was 94%, and shallow water habitat classification with and without density class respectively were 54% and 68%, respectively. In the other hand, the thematic accuracy of Worldview-2 for land cover lassification was 60%, and shallow water habitats classification with and without density class respectively were 38% and 56%, respectively.

Accuracy assessment value showed that the use of UAV data gave better results than Worldview-2 satellite imagery. Differences in accuracy assessment results were due to the differences in spatial resolution, additional information such as digital surface model, and sunglint effect on Worldview-2. The UAV method have more advantages in rapid data acquisition, very high spatial resolution, and digital surface model data compared to Worldview-2 imagery, but lack of spectral resolution quality, the vehicle risk, and a specific human resources skill for operating the vehicle. The UAV data utilization for mapping coastal and marine resources of small island can become a substitute for the use of common satellite imagery.</i>